UNIVERSITY OF HAWAII
LIBRARY

AUG 2 '60

MADROÑO

A WEST AMERICAN JOURNAL OF BOTANY

VOLUME 15, NUMBER 7 JULY, 1960

Contents

PAGE

SANICULA DESERTICOLA, AN ENDEMIC OF BAJA CALIFORNIA, *Peter H. Raven* and *Mildred E. Mathias* 193

A NEW SPECIES OF VALERIANA FROM BRAZIL, *Frederick G. Meyer* 197

STUDIES IN WESTERN VIOLETS, IX. MISCELLANEOUS SPECIES IN THE SECTIONS NOMIMIUM AND CHAMAEMELANIUM, *Milo S. Baker* 199

CHROMOSOME NUMBERS IN SILENE (CARYOPHYLLACEAE). II, *A. R. Kruckeberg* 205

A NEW SPECIES OF ZINNIA FROM MEXICO, *A. M. Torres* 215

A COMMENT ON COLD SUSCEPTIBILITY OF PONDEROSA AND JEFFREY PINES, *Willis W. Wagener* 217

DOCUMENTED CHROMOSOME NUMBERS OF PLANTS 219

REVIEW: Mont E. Lewis, *Carex—its Distribution and Importance in Utah* (Jack Major) 221

NOTES AND NEWS: EDWARD LEE GREENE CORRESPONDENCE, *Robert P. McIntosh*; UROSPERMUM PICROIDES IN BERKELEY, *Annetta Carter* 222

PUBLISHED QUARTERLY BY THE CALIFORNIA BOTANICAL SOCIETY

MADROÑO

A WEST AMERICAN JOURNAL OF BOTANY

Entered as second-class matter at the post office at Berkeley, California, January 29, 1954, under the Act of Congress of March 3, 1879. Established 1916. Subscription price $6.00 per year. Published quarterly and issued from the office of Madroño, Herbarium, Life Sciences Building, University of California, Berkeley 4, California.

BOARD OF EDITORS

HERBERT L. MASON, University of California, Berkeley, Chairman
EDGAR ANDERSON, Missouri Botanical Garden, St. Louis
LYMAN BENSON, Pomona College, Claremont,. California.
HERBERT F. COPELAND, Sacramento College, Sacramento, California.
JOHN F. DAVIDSON, University of Nebraska, Lincoln.
IVAN M. JOHNSTON, Arnold Arboretum, Jamaica Plain, Massachusetts.
MILDRED E. MATHIAS, University of California, Los Angeles 24.
MARION OWNBEY, State College of Washington, Pullman.
IRA L. WIGGINS, Stanford University, Stanford, California.

Secretary, Editorial Board—ANNETTA CARTER
Department of Botany, University of California, Berkeley.

Business Manager and Treasurer—JOHN H. THOMAS,
Dudley Herbarium, Stanford University, Stanford, California

CALIFORNIA BOTANICAL SOCIETY, INC.

President: Herbert G. Baker, Department of Botany, University of California, Berkeley, California. First Vice-president: Malcolm A. Nobs, Carnegie Institution of Washington, Stanford, California. Second Vice-president: Herbert F. Copeland, Sacramento City College, Sacramento, California. Recording Secretary: Mary L. Bowerman, Department of Botany, University of California, Berkeley, California. Corresponding Secretary: Francia Chisaki, Department of Botany, University of California, Berkeley, California. Treasurer: John Thomas, Dudley Herbarium, Stanford University, Stanford, California.

SANICULA DESERTICOLA, AN ENDEMIC OF BAJA CALIFORNIA

Peter H. Raven and Mildred E. Mathias[1]

One of the more restricted species of northern Baja California is *Sanicula deserticola* Bell, known from a few disjunct populations at the northern margin of the Sonoran Desert. One population is known from near El Mármol at the headwaters of the Arroyo de San Fernando, while others are in the yellow hills northwest of Rancho Arenoso and near Rancho Aguajito, both in the drainage of the Arroyo del Rosario. At the last-mentioned locality, it was found growing abundantly on the northwest-facing slopes of a yellow conglomerate hill, 3.6 miles west of Rancho Aguajito (*Raven, Mathias, and Turner 12,678*), associated with *Rosa minutifolia, Euphorbia misera, Yucca whipplei eremica, Idria columnaris, Eriogonum fasciculatum, E. scalare, Encelia californica* var. *asperifolia, Calandrinia maritima, Harfordia macroptera, Brodiaea pulchella, Layia platyglossa,* and *Filago californica*, as well as two species of *Agave* and one each of *Dudleya, Mammillaria, Echinocereus, Echinocactus,* and *Opuntia*. This curious mixture of characteristic members of the California flora and such species as *Idria columnaris,* restricted to the Sonoran Desert, clearly demonstrates the unique ecological position of *Sanicula deserticola*.

The subfamily Saniculoideae of the Umbelliferae, with some 260 species, like the other subfamilies Hydrocotyloideae and Apioideae, has apparently had a long and independent evolutionary history. The distribution of the extant genera of Saniculoideae shows clearly that they have developed within the Arcto-Tertiary Geoflora and have been associated with it for a long time, perhaps since late Mesozoic time when this Geoflora is first recognized in the fossil record. Several of the genera in this subfamily are restricted to areas of Arcto-Tertiary-derived deciduous forest in eastern Asia. Others range south along mountain chains to Africa. The genus *Eryngium* is world-wide in distribution, whereas the genus *Sanicula* is exceedingly widespread in the Northern Hemisphere, with some of its species occurring also in the Southern Hemisphere. Shan and Constance (1951) considered the section *Sanicula* (*Sanicla*), with about one-third of the species of the genus *Sanicula*, the main trunk of the genus. Some species of this section are widespread in Eurasia, and their present distribution suggests development of the section from a northern stock with subsequent southerly migrations. In North America *S. marilandica* L. and *S. trifoliata* Bickn., which Shan and Constance considered probably the least advanced species, occur as common associates of the eastern deciduous forests. The distribution of this section is therefore closely related to that of the Arcto-Tertiary Geoflora.

---

[1] The authors would like to acknowledge the helpful suggestions of Dr. Harlan Lewis in the preparation of this paper.

Madroño, Vol. 15, No. 7, July 13, 1960.

In western North America, the genus *Sanicula* is represented by section *Sanicoria*, which Shan and Constance showed was probably derived from members of section *Sanicula*. *Sanicula deserticola* is one of fourteen species comprising section *Sanicoria,* which is the most diverse within the genus in vegetative and reproductive characters. The development of the Madro-Tertiary Geoflora in early Tertiary time in western North America involved a segregation of species from the dry margins of the tropics and from the Arcto-Tertiary Geoflora,—a segregation fostered by the ever-increasing influence of aridity, particularly the loss of summer rain, and of more extreme temperature variation over much of the West (Axelrod, 1958). Increasing environmental diversity in this area has resulted in large measure from the continuation of this process of progressively increasing aridity, and the evolution of section *Sanicoria* was doubtless correlated with the development of this climatic and topographic diversity. Bell (1954) showed that the different diploid species of section *Sanicoria* differ in their environmental preferences. The existence of localized species in specialized environmental situations is unique to this section. Thus *Sanicula peckiana* F. Macbr. occurs only on serpentine, *S. saxatilis* Greene occurs only on volcanic or serpentinized rocks, *S. arctopoides* H. & A. occupies coastal bluff and dune habitats, and *S. maritima* Kell. is a local species confined to moist adobe soil near the coast. Although some species of the section are less sharply differentiated ecologically, they are, as a class, plants of relatively xeric habitats in chaparral and various oak-conifer woodland associations derived from the Madro-Tertiary Geoflora. One species, *S. graveolens* Poepp., ranges widely north and east, and others occur in suitable sites north along the Pacific Coast, but most of the species of section *Sanicoria* are members of the California flora in the broad sense as delimited by Howell (1957). The occurrence of two mesophytic species of *Sanicula* on the western coast of South America is, we believe, the product of relatively recent long-range transtropical dispersal of the type discussed by Grant (1959) and by Raven and Lewis (1959).

On morphological grounds, the species most closely related to *Sanicula deserticola* is *S. bipinnatifida* Dougl., but nevertheless the two are amply distinct. *Sanicula bipinnatifida* is found colonially in open rocky grassland from Washington south to the northern edge of Baja California, in regions with average annual precipitation ranging from about 12 to 40 inches. The populations of *S. deserticola* are about 150 miles south of the range of *S. bipinnatifida* in a region with an average annual precipitation that ranges from perhaps 2 to 7 inches (fig. 1). It is therefore found in a habitat which with respect to aridity is very extreme for members of section *Sanicoria* and for the genus *Sanicula* as a whole. In its native habitat *S. deserticola* probably flowers whenever it has sufficient water. This is suggested by its flowering response when grown at the University of California, Los Angeles, where it flowered twice a year when supplied with abundant water.

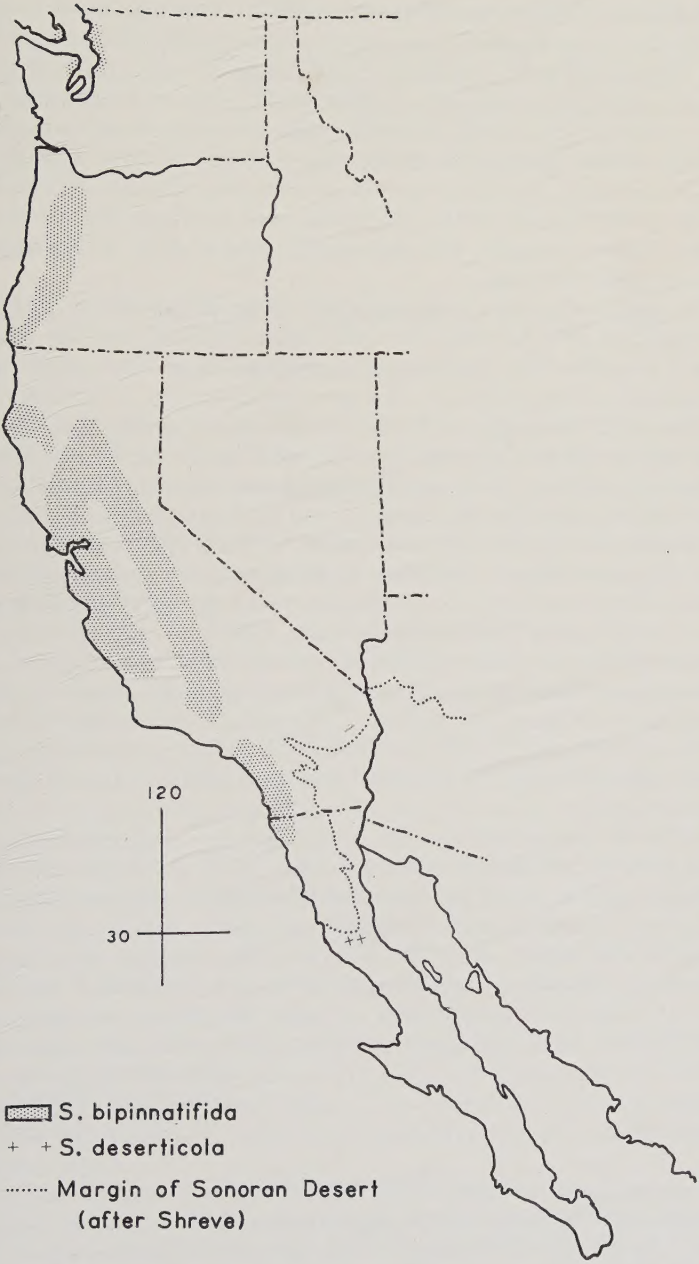


FIG. 1. A portion of western North America, showing ranges of *Sanicula deserticola* and *S. bipinnatifida* and approximate line of demarcation between desert and chaparral in Baja California.

Rodríguez (1957) found that the vessels of *Sanicula deserticola* have the smallest mean length for any member of the family that he examined; this, together with its long taproot and clumped habit, indicate its advanced position compared with *S. bipinnatifida*. One may reasonably infer that populations ancestral to both became differentiated at the southern margins of their distribution in response to an arid climate. The disjunct populations of *S. deserticola* may have been somewhat more continuous during pluvial periods of the Pleistocene, but at which time period this species became spatially and genetically isolated from *S. bipinnatifida* cannot be demonstrated.

The area of *Sanicula deserticola* lies along the southern margins of the transition area between the Californian chaparral and the Sonoran Desert, as defined by Shreve (1936). Shreve noted that species which are endemic in the transition area are preponderantly of northern relationship, while the plants of the desert area are more sharply confined to their own formation. He explained this relationship by the fact that the only requirement for the long southward extension of a chaparral species is a relatively moist habitat, however restricted in area this may be, while the requirements for northward extension of desert species are more complex. The approximate boundary between the two areas is shown in figure 1. *Sanicula deserticola* is certainly such a species of northern affinities. A parallel distributional pattern and relationship are found in the shrubby *Salvia chionopeplica* Epling; this species also consists of a few disjunct populations in north-central Baja California, and it is closely related to other species of section *Audibertia*, such as *Salvia leucophylla* Greene. The distribution of most species of *Salvia* sect. *Audibertia* is associated with the California flora and therefore similar to that of *Sanicula* sect. *Sanicoria*.

Within the genus *Sanicula*, the section *Sanicoria*, apparently stemmed from ancestors adapted to relatively mesic sites within the area of the Arcto-Tertiary Geoflora and occupied successively drier and drier habitats offered by the expansion and differentiation of the Madro-Tertiary Geoflora. The species of section *Sanicoria* that occupies the most xeric habitats is *Sanicula deserticola*. Relatively few perennial Umbelliferae occur in such habitats, and most of those that do are members not of Saniculoideae, but of the larger and more diverse subfamily Apioideae.

Department of Botany
University of California
Los Angeles, California

Literature Cited

Axelrod, D. I. 1958. Evolution of the Madro-Tertiary Geoflora. Bot. Rev. 24:433–509.

Bell, C. R. 1954. The Sanicula crassicaulis complex (Umbelliferae). Univ. Calif. Publ. Bot. 27:133–230.

Grant, V. 1959. Natural history of the phlox family. Vol. I. Systematic botany. The Hague: Martinus Nijhoff.

Howell, J. T. 1957. The California flora and its province. Leafl. West. Bot. 8:133–138.

RAVEN, P. H., and H. LEWIS. 1959. The relationship of clarkias from two continents. Brittonia 11:193–205.
RODRÍGUEZ, R. L. 1957. Systematic anatomical studies on Myrrhidendron and other woody Umbellales. Univ. Publ. Bot. 29:145–318.
SHAN, R. H., and L. CONSTANCE. 1951. The genus Sanicula (Umbelliferae) in the Old World and the New. Univ. Calif. Publ. Bot. 25:1–78.
SHREVE, F. 1936. The transition from desert to chaparral in Baja California. Madroño 3:257–264.

A NEW SPECIES OF VALERIANA FROM BRAZIL

FREDERICK G. MEYER

Valeriana glechomifolia sp. nov. Herba perennis omnino puberula, longe repens; caulis tenuis foliosus; folia opposita, laminis suborbicularibus vel orbiculari-reniformibus, crenato-dentatis, petiolis 0.6–1.4 cm. longis; inflorescentia erecta, 4–10 cm. longa; flores hermaphroditi; corolla infundibuliformis 2–2.5 mm. longa; achaenia oblonga vel elliptica aliquantulum ampulliformia ubique puberulenta; calycis limbus brevicupuliformis plus minusve dentatus.

Uniformly puberulent long-creeping perennial, rooting at the nodes; stems slender, terete, about 1 mm. in diameter, leafy, the internodes 1–2.5 cm. long; leaves opposite, erect or ascending, the blades suborbicular to orbicular-reniform, 0.6–1.5 cm. wide, sometimes truncate at the base, uniformly crenate-dentate, the petioles 0.6–1.4 cm. long; inflorescence an aggregate or compound dichasium, erect, 4–10 cm. long, arising on a slender stalk from leaf axils along the creeping stems, with 1–3 pairs of leaves, the terminal dichotomies about 1–3 cm. wide in anthesis, later more diffuse, the bracts 1–3 mm. long, more or less spathulate, the flowers hermaphroditic; corolla infundibuliform, 2–2.5 mm. long, glabrous, the tube gibbous, the lobes 5, spreading, slightly unequal; stamens 3, exserted, 2-lobed; style 3-lobed; achenes oblong to elliptic, about 1.5 mm. long, somewhat ampulliform, more or less oblique, uniformly puberulent; calyx-limb short-cupuliform, more or less dentate.

Specimens examined. BRAZIL. Santa Catarina, Mun. Bom Retiro: Campo between Fazenda Campo dos Padres and Fazenda Santo Antonio, Campo dos Padres, alt. 1400–1650 m., November 21, 1956, *L. B. Smith* & *R. Klein 7800* (type US); same locality, January 24, 1957. *L. B. Smith* & *R. Reitz 10383*.

The combination of creeping habit and leaves that resemble those of *Glechoma hederacea* quickly distinguishes *V. glechomifolia* from all other New World valerianas. The fruit of *V. glechomifolia* allies it with other Brazilian valerianas with a coronate calyx-limb in the group with *V. salicariifolia, V. chamaedryfolia, V. foliosa,* and *V. eichleriana,* but the uniformly puberulent and more or less oblique achenes of *V. glechomifolia*

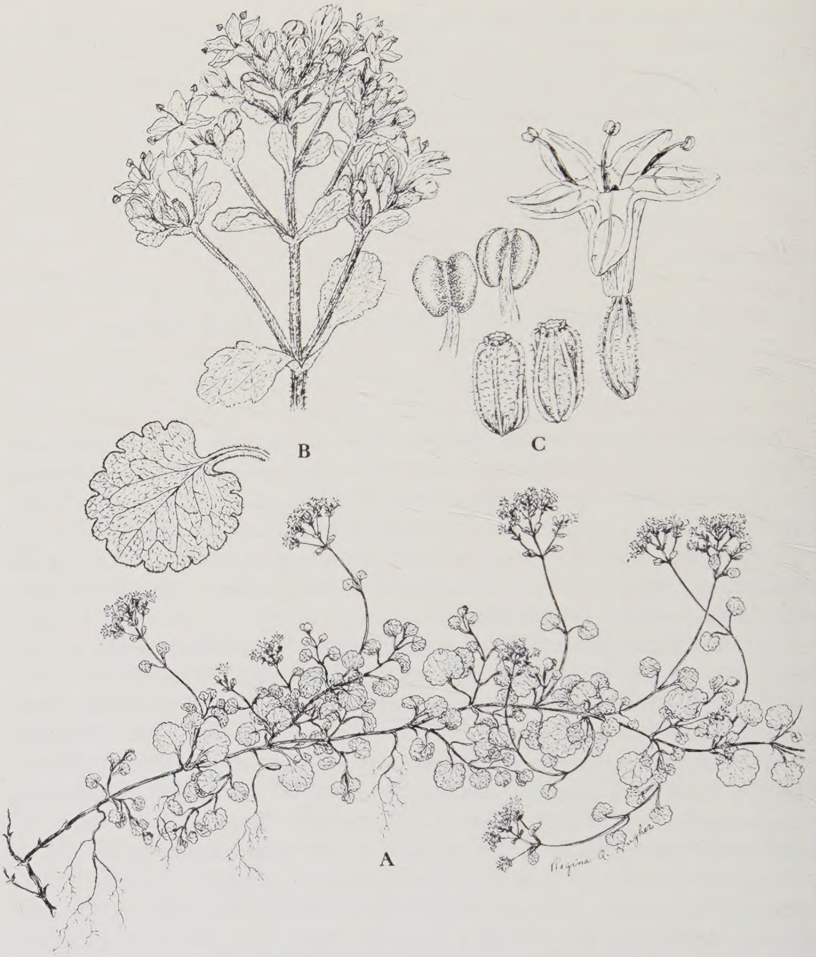


FIG. 1. *Valeriana glechomifolia*: A, habit, × ¾; B, inflorescence and single leaf, × 3; C, fruit, flower, and stamens, × 10, *Smith* & *Klein 7800*.

differ from the uniformly glabrous and regular achenes of the aforementioned Brazilian species.

Students of South American *Valeriana* reserved the segregate genus *Phyllactis* for species with coronate calyx. My own studies previously on North American species and now on those of South America indicate that single character differences, especially floral differences, are insufficient in differentiating segregate genera. Indeed, the specialized calyx, either coronate or pappus-like, and more especially the sculpturing of the cypselate achene combine with vegetative characters in the differentiation of species of South American *Valeriana*.

This interesting discovery by Lyman B. Smith of the Smithsonian Institution, Washington, D.C., is one of a long series of new plants discovered on Dr. Smith's fruitful collecting trip to Santa Catarina in 1956–57.

Crops Research Division, Agricultural Research Service
U.S. Department of Agriculture
Beltsville, Maryland

STUDIES IN WESTERN VIOLETS, IX. MISCELLANEOUS SPECIES IN THE SECTIONS NOMIMIUM AND CHAMAEMELANIUM

MILO S. BAKER

This paper treats four taxa of *Viola* in the sections *Nomimium* and *Chamaemelanium*—a newly described species, a change of status from species to subspecies for a second taxon, observations confirming the specific status of a third taxon, and a newly described subspecies. In addition to my own specimens at the North Coast Herbarium, I have cited specimens from the United States National Herbarium, the New York Botanical Garden, the California Academy of Sciences, and the University of California Herbarium; to the curators of these latter herbaria I express my appreciation.

Viola Aliceae sp. nov. Herba exigua omnino puberulenta cauli supraterrano brevissimo suppressoque et rosella basali foliorum ac floribus uno duobusque folias parum excedentibus instructa cauli subterreno gracili bracteas squamas simulantes gerente, tota ex radice fusiformi longitudine variabili (ut apud specimina typica videtur) crescens; folia oblongo-ovata vel elliptica obscure undulato-dentata decurrentia 2 vel 3 cm. longa dimidio lata petiolis laminas longitudine aequantibus; stipulae inconspicuae lanceolatae marginis laceratis; flores caesii longitudine 1 cm. parum excedentes petalis angustis eis lateralibus aliquantulo barbatis; stigma ut id *Violae aduncae* ebarbatum; et capsula et semina hucusque ignoti.

A small plant, 5 to 11 cm. high, caulescent but the aerial stem undeveloped, bearing a rosette of leaves and one or two flowers slightly above the leaves; finely puberulent throughout; subterranean stem slender with scale-like bracts; taproot variable in length (as in type sheet); leaves long-ovate to elliptic, obscurely undulate-dentate, decurrent, 2 to 3 cm. long and half as wide, on petioles about as long; stipules inconspicuous, lanceolate with lacerate margins; flowers lavender, slightly more than 1 cm. long; petals narrow, the lateral slightly bearded; stigma like that of *Viola adunca* but without beards; capsule and seeds unknown. Figs. 1, 2.

Type. MEXICO. Near kilometer 34 post on Mexico City–Cuernavaca highway, altitude 9000 feet, *A. Y.* and *J. E. Wilcox* in 1948 (UC 1,200,-778). Topotype. *A. Y.* and *J. E. Wilcox 22,* 1946. *Viola Aliceae* should be assigned to Section *Nomimium* Ging., although the stigma and style are somewhat different from other members of this section.

When making their second collection of the violet in 1948, the one cited above as the type, Mr. and Mrs. Wilcox dug deeply to investigate the character of the root system. In 1952 they returned to the type locality, but a diligent search of several hours failed to reveal any plants of this violet.

In some cases the underground stem measures only a few centimeters, and could represent the normal growth from a seed over a few years, such as the upper right hand plant (topotype, *Wilcox 22*) on the type sheet. In other cases the vertical subterranean stem is very slender and possesses a number of scale-like bracts at more-or-less regular distances apart, such as the plant on the upper-left-hand side of the type sheet (type collection, *Wilcox* in 1948). How such a stem was formed is not clear. It might be formed by underground stolons from another plant such as that represented by the topotype. However, I do not know of such a case in any other species of *Viola*.

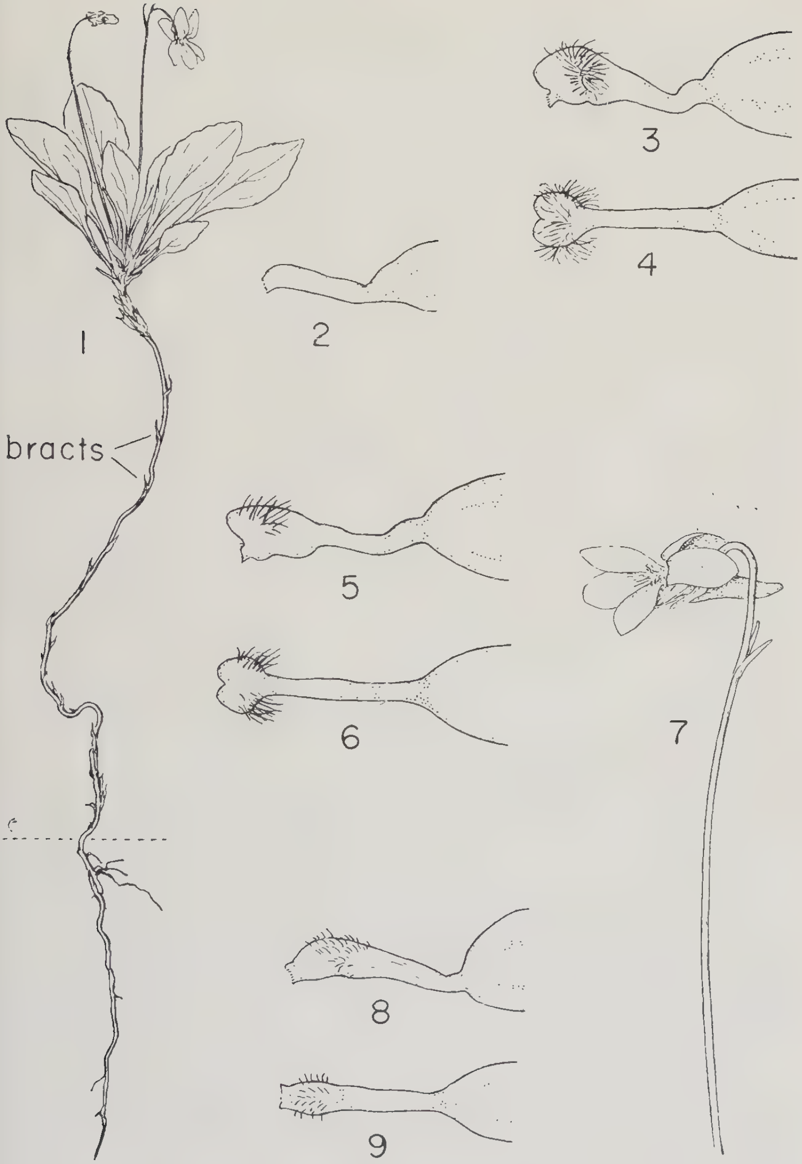
Two other collections of *Viola* resemble *V. Aliceae* in having similar slender underground stems as well as similar style and stigma, but they differ from that species in being wholly glabrous [Quebrada Honda, Durango, *Palmer 227* (US, NY); Sierra Madre near Chihuahua, *Townsend* & *Barber 94* (US, NY)]. Their exact relationship to *V. Aliceae* cannot be determined at this time. Some of the plants on the Palmer sheet, however, represent another species unrelated to *V. Aliceae.*

VIOLA LOBATA Benth. subsp. **psychodes** stat. nov. *V. psychodes* Greene, Pittonia 3:318. 1898.

In 1898, E. L. Greene proposed the name *V. psychodes* for a violet collected near Waldo, Oregon. Since then, this taxon has been collected at many locations in California. In general *V. psychodes* resembles *V. lobata,* which is abundant in California. The differences between these two taxa do not seem of sufficient magnitude to merit retention of both of them as species; therefore I propose treating *V. psychodes* as a subspecies of the common *V. lobata* Benth, section *Chamaemelanium* Ging. Both have similar root systems, a naked stem with leaves and flowers borne near the summit, leaves that may be variously lobed or even entire, and similar pistils (figs. 3–6). Plants of both taxa have the habit of producing a single radical leaf for the first year.

There are, however, some differences between the two, the most significant being that subsp. *psychodes* is glaucous throughout, while *V. lobata* is puberulent. Another difference is leaf thickness—the average for *V. lobata* is 0.0036 inch, while for subsp. *psychodes* it is 0.0057 inch. The measurements for these averages were obtained from leaves of ten collections of each taxon, using a Starrett micrometer which is accurate to one ten thousandths of an inch.

It may be of interest to note that several of the collections of subsp.



FIGS. 1–9. *Viola.* FIGS. 1, 2, *V. Aliceae: 1,* habit, × ¾; *2,* pistil, side view. FIGS. 3, 4, *V. lobata* subsp. *lobata*: *3,* pistil, side view; *4,* pistil, dorsal view. FIGS. 5, 6, *V. lobata* subsp. *psychodes*: *5,* pistil, side view; *6,* pistil, dorsal view. FIGS. 7, 8, 9, *V. oxyceras*: *7,* flower, × 1½; 8, pistil, side view; *9,* pistil, dorsal view. All pistil illustrations × 9.

psychodes were made in serpentine areas, but I have not been able to ascertain whether or not the plant is restricted to serpentine soil.

Representative specimens. OREGON. JOSEPHINE COUNTY: Little Rock Creek, 2 miles southwest of O'Brien, *Constance & Rollins 2995* (NCH, UC); open woods near Waldo, Oregon, April 20, 1887, *Howell* (UC); near Kirby, *Baker 5526* (NCH). CALIFORNIA. Hearst Castle [Sacramento Canyon], July 22, 1902, *Setchell & Dobie* (UC); serpentine on west side of Sacramento River Canyon, *Wagnon 1616* (NCH). BUTTE COUNTY: east of Oroville, west of Brush Creek Ranger Station, *Cantelow* 4527 (CAS). DEL NORTE COUNTY: on serpentire, Gasquet, *Baker 211* (NCH), *Baker 285* (NCH); near Gasquet, *Tracy 10011* (UC); headwaters Shelly Creek, Oregon Mountain, *Hoffman* (NCH). PLUMAS COUNTY: Highway 39 east of summit near Mineral, *Baker 8104* (NCH). SHASTA COUNTY: Delta, *Applegate 5396* (NCH); Castella, June 19, 1923, *Bethel* (CAS); Castle Rock, *Ripley & Barneby 9642* (CAS); on serpentine, Dunsmuir, *Baker 8050* (CAS, UC), *Hall & Babcock 4031* (UC), *Heller 7927* (UC); on serpentine, Shasta Retreat, July 4, 1911, *Condit* (UC); Mount Eddy (some genes of *V. lobata* Benth.), June 1, 1946, *Parker* (UC). SISKIYOU COUNTY: Rainbow Ridge above Sulloway Creek, about 1½ miles west of Mount Shasta City, June 13, 1936, *Babcock & Stebbins 2000* (UC); near Mount Shasta City, *Baker 5525* (NCH); serpentine on east slope Scott Mountain, *Hoffman 2434* (NCH); 6½ miles north of West Brand Road, Happy Camp, *Hoffman 2572* (NCH); trail 1 mile west of Lookout, Clear Creek, *Hoffman 3514* (NCH). TRINITY COUNTY: near Granite Peak, *Baker 205* (NCH); Minersville to Trinity Center, *Eastwood & Howell 4912* (CAS); between Baylers and Trinity Center, *Hoffman 2420* (NCH); Trinity Alps Resort, *Cantelow 995* (CAS); North Fork Mountain, 3500 feet, *Hoffman 3504* (NCH); near boundary of Trinity and Siskiyou counties, Scott Mountain, *Howell 13618* (CAS); north slope of Scott Mountain, 3700 feet, *Cantelow 1453* (CAS); south slope of Scott Mountain, *Cantelow 1452* (CAS); Scott Mountain Road, 11½ miles north of Carrville, June 9, 1939, *Cantelow* (CAS); Nash Mine near Carrville, June 23, 1931, *Van Dyke* (CAS); 17 miles north of Carrville, May 21, 1936, *Cantelow* (CAS); 3 miles north of Carrville, May 21, 1936, *Cantelow* (CAS).

VIOLA OXYCERAS Greene. On the Pacific Coast of North America there are two distinct species of caulescent blue-flowered violets in the section *Nomimium* Ging.: *V. adunca* J. E. Smith, which is found from sea level to a fairly high altitude, and *V. oxyceras* Greene, which grows in the mountains down to about 4000 feet. The latter was considered by Sereno Watson to be only a variety of what we now call *V. adunca* [*V. canina* var. *oxyceras* Wats., Brew. and Wats., Bot. Calif. 1:56. 1876]. This viewpoint may have arisen because in some localities interbreeding between these two species has produced intermediate forms; at most localities, however, the pure types remain distinct.

Aside from their similarity in flower color, the two have little in common. The leaves of *V. adunca* are ovate, more or less subcordate at the base, and have a pointed apex; those of *V. oxyceras* are much thinner, sometimes wider than long, with a cuneate or truncate base (never cordate), and are rounded at the apex. The foliage of *V. adunca* shows some puberulence (except for occasional glabrous races), while that of *V. oxyceras* is without exception entirely glabrous. The form of the flower in these two is different; the flowers of *V. adunca* are larger, having the petals spread in approximately one plane, and having a rather blunt spur; those of *V. oxyceras* are smaller, the upper four petals lie mostly in one plane, but the lower petal lies below in another plane (fig. 7). The beak of the style in *V. adunca,* although always directed essentially downward, may be pointed forward, or may be at right angles to the axis of the style, or may even assume a still more reflexed position, and it has always a smaller diameter than the head of the style. The beak of *V. oxyceras,* with its stigmatic tube always pointing forward, is very different, having a diameter nearly as large as the head of the style (figs. 8, 9).

The seeds of *V. adunca* and *V. oxyceras* differ also, in both shape and in size. Although the seeds of *V. adunca* vary quite widely in size, they are never as small as the seeds of *V. oxyceras*. But more important than size, the seeds of these two taxa are of different shape. The more rounded seed of *V. oxyceras* is indicated by a length to width ratio of 1.85 to 1, while in the case of *V. adunca* (from six localities) the ratio is 1.98 to 1. With these differences in mind, the maintenance of the two species seems justified.

Representative specimens. CALIFORNIA. High mountain near Donner Pass, 1865, *Torrey 34* (UC), type of *V. canina* var. *oxyceras* Wats. ALPINE COUNTY: Lake Alpine, *Allen 542* (UC); near Lake Alpine, 7,500 feet, *Peirson 11567* (UC). AMADOR COUNTY: Silver Lake, 7,500 feet, *Baker 8557* (NCH). BUTTE COUNTY: Jonesville, 1,500 m., *Copeland 662* (UC); Jonesville, *Copeland 1219* (NCH). EL DORADO COUNTY: Highway 50, 1 mile east of Strawberry, 6,500 feet, *Robbins 1712* (UC); near Lyons Creek about 4 miles south of Wright Lake, 6,700 feet, *Robbins 2020* (CAS, UC), *Robbins 2022* (NCH). FRESNO COUNTY: Vidette Creek, 10,500 feet, 1948, *Dyer* (CAS); Bubb's Creek, at base of East Vidette, 1948, *Chabaud* (CAS); Second Recess, 9,000 feet, *Raven 5697* (CAS). INYO COUNTY: Cottonwood Lakes, 11,000 feet, *Alexander & Kellogg 3417* (UC). TULARE COUNTY: Tyndall Creek, 1916, *Campbell* (CAS). LASSEN COUNTY: Summit Lake, *McCalla 646* (NCH); east fork of King Creek on Cinder Cone Trail, 7,000 feet, *Jepson 4110* (JEPS). MARIPOSA COUNTY: Eagle Peak, Yosemite, 7,200 feet, *Jepson 4372* (JEPS). MODOC COUNTY: High Grade District, northern Warner Mountains, 7,000 feet, *Smith 948* (JEPS). PLACER COUNTY: above Donner Lake, *Copeland 1883* (UC); below Cisco, *Heller 12713* (UC); Summit Valley, *Howell 18577* (CAS). PLUMAS COUNTY: Little Grass Valley, *Baker 9966* (NCH); 1½ miles west of Johnsville, 5,300 feet, *Cantelow 4560* (CAS). SHASTA COUNTY: 22 miles southeast of McCloud, *Cantelow* (NCH). SIERRA COUNTY: Webber Lake, 8,000 feet, *Baker* (NCH). SISKIYOU COUNTY: Marble Mountain, *Chandler 1585* (NCH). TEHAMA COUNTY: near Morgan, 5,500 feet, *Hall & Babcock 4326* (UC). TULARE COUNTY: Camp 170, nine miles north of Mt. Silliman, *Brewer 2807* (UC); South Fork Kaweah River, 8,500 feet, *Ferris & Lorraine 10850* (UC); Center Basin, 11,200 feet, 1948, *Howell 25057* (CAS); Second Lake, Center Basin, 11,400 feet, *Munz 12565* (NCH). TUOLUMNE COUNTY: Kennedy Lake, *Hoover 1458* (UC).

VIOLA BAKERI Greene subsp. **shastensis** subsp. nov. A subspecie *Bakeri* capsulis pubescentibus et paginis sepalorum pilos paucos breves adpressos gerentibus discedit.

This subspecies differs from *V. Bakeri* subsp. *Bakeri* (section *Chamaemelanium* Ging.) in its pubesent capsules and in the presence of a few short appressed hairs on the faces of the sepals.

During the flowering stage, before the appearance of the capsules, subsp. *shastensis* may be distinguished from subsp. *Bakeri* by a careful examination of the sepals. In subsp. *Bakeri,* the faces of the sepals are entirely glabrous and without any short, appressed hairs such as those found on the faces of the sepals in subsp. *shastensis*. In other respects, as far as I have observed, these taxa are identical.

Type. Postpile Camp, altitude 6000 feet, western Tehama County, California, July 1, 1955, *Baker 13045* (UC 1,199,915); topotype, July 10. 1954, *Baker 12961* (NCH).

Since its discovery in western Tehama County in 1954, *V. Bakeri* subsp. *shastensis* has been found to occur from southern Oregon south in the western slopes of the Sierra Nevada of California to Amador County, as detailed below.

Other collections. OREGON: Road to Dutchman's Peak, May 30, 1938, *Rowntree* (NCH). CALIFORNIA. TRINITY COUNTY: Scott Mountain, *Cantelow 4576* (CAS), *Baker 13139* (NCH), *Wagnon* & *Barbe* (NCH). LASSEN COUNTY: "devastated area" earth slide, Highway 89, north side Mount Lassen, *Baker 11975* (NCH). AMADOR COUNTY: Silver Lake, altitude 7,400 feet, *Wagnon 1620* (NCH).

One may ask, why should such inconspicuous characters justify the creation of a new subspecies? Our reply is that in the subsection *Nuttallianae* Becker, naked capsules have long been regarded as a diagnostic character separating the *V. Nuttallii* species complex from the *V. purpurea* complex. However, recent studies in *V. praemorsa* of the *Nuttallii* complex have shown that two subspecies have some puberulence of the capsules. Nevertheless, the most widely distributed subspecies, *V. praemorsa* subsp. *major* (Hook.) Baker, subsp. *linguaefolia* (Nutt.) Baker, and subsp. *praemorsa* have naked capsules.

One also wonders how and when subsp. *shastensis* derived its characters. Examination of *V. praemorsa* subsp. *arida* Baker and subsp. *oregona* Baker & Clausen reveals the fact that they both possess the same pattern of sepal pubescence as does *V. Bakeri* subsp. *shastensis*. In addition, these two subspecies of *V. praemorsa* have more or less pubescence on their capsules. Although there is no known overlap at the present time in the distribution of *V. Bakeri* subsp. *shastensis* and these two Great Basin subspecies of *V. praemorsa,* it is known that an arm of the Great Basin Flora extends from southern Oregon southwest along the Klamath River into the Shasta and Scott valleys, and this lends credence to the belief that *V. praemorsa* subsp. *arida* will be found to occur somewhere in this area not far distant from where we collected *V. Bakeri* subsp. *shastensis*.

From bud fixations of subsp. *shastensis* made in the Scott Mountains, (*Baker 13133, 13139*) Dr. Jens Clausen and Dr. Malcolm Nobs of the Carnegie Institution of Washington at Stanford obtained a chromosome count of $2n = 48$, showing this taxon to be an octoploid. *Viola Bakeri* subsp. *Bakeri* and *V. praemorsa* subsp. *arida* and subsp. *oregona* are also octoploid, $2n = 48$. Therefore, it may be assumed that gene interchange could have taken place between these entities at some past time, thus possibly accounting for the pubescence of the sepals and capsules of *V. Bakeri* subsp. *shastensis*.

Santa Rosa Junior College
Santa Rosa, California

CHROMOSOME NUMBERS IN SILENE (CARYOPHYLLACEAE). II.

A. R. KRUCKEBERG[1]

The accumulation of cytotaxonomic data from members of the subfamily Silenoideae (Caryophyllaceae) continues, with this second report adding chromosome numbers of thirty-two species counted for the first time. Additional records are given here for twenty of the species included in the first paper of this series (Kruckeberg, 1954). In all, the present report comprises chromosome counts for one hundred and fifty-six collections from continental North America, Hawaii, Europe, and Asia. The chromosome numbers are listed in Table 1; figures 1–28 are camera lucida drawings of chromosome complements for species hitherto uncounted.

Records of chromosome numbers of the Silenoideae are being accumulated for two reasons. Chromosome counts have intrinsic value as part of the total self-portrait of a taxon. Secondly, the ploidy level of any two populations qualifies the success with which those population samples can be used in hybridizations to determine species interfertilities (see Kruckeberg, 1955).

All counts have been made from squashes of microsporocytes handled in the manner outlined in Kruckeberg (1954). Most of the material I have collected in native habitats of western United States. Collections from eastern United States and from localities outside continental North America were kindly furnished by other botanists.

TABLE 1. DIPLOID CHROMOSOME NUMBERS IN LYCHNIS AND SILENE

WESTERN NORTH AMERICAN SPECIES	2n Chromosome Number	Number of Collections
Lychnis drummondii (Hook.) Wats.	48	5
Silene aperta Greene	48	1
S. bridgesii Rohrb.	48	1
S. californica Durand. Tetraploid	48	2
Hexaploid	72	1
S. campanulata Wats.	48	1
S. clokeyi H. & M.	96	1
S. douglasii Hook.	48	22
S. grayi Wats.	48	3
S. hookeri Nutt. ex T. & G.	72	3
S. invisa H. & M.	48	3
S. laciniata Cav. subsp. *major* H. & M. Octoploid	96	4
S. laciniata Cav. subsp. *greggii* (Gray) H. & M. Tetraploid	48	10
S. lemmonii Wats.	48	5

---

[1] Supported by funds from the State of Washington Initiative No. 171 and by the National Science Foundation, Grant G-1323.

	2n Chromosome Number	Number of Collections
S. marmorensis Kruck.	48	1
S. menziesii Hook. Diploid	24	2
Tetraploid	48	12
S. montana Wats.	48	4
S. nuda (Wats.) H. & M.	48	3
S. nuda subsp. *insectivora* (Hend.) H. & M.	48	1
S. occidentalis Wats.	48	1
S. oregana Wats.	48	1
S. parishii Wats.	48	3
S. parryi (Wats.) H. & M. Tetraploid	48	9
Octoploid	96	6
S. petersonii Maguire	96	2
S. repens Patrin subsp. *australe* H. & M.	24	2
S. sargentii Wats.	48	3
S. scaposa Robins.	48	1
S. scouleri Hook.	48	1
S. spaldingii Wats.	48	1
S. thurberi Wats.	48	1
S. verecunda Wats. subsp. *verecunda*	48	1
S. verecunda Wats. subsp. *andersonii* (Clokey) H. & M.	48	1
S. verecunda Wats. subsp. *platyota* (Wats.) H. & M.	48	10
S. williamsii Britt.	24	2
S. wrightii Gray	96	1
Eastern North American Species		
Silene antirrhina L.	24	1
S. caroliniana Walt.	48	2
S. caroliniana subsp. *wherryi* (Small) Clausen	48	1
S. polypetala (Walt.) Fern. & Schub.	48	1
S. regia Sims.	48	2
S. rotundifolia Nutt.	48	1
S. stellata (L.) Ait. *sensu lat.*	48	5
S. subciliata Robins.	48	1
S. virginica L.	48	1
Species Outside Continental North America		
Lychnis wilfordii Maxim.	24	1
Petrocoptis pyrenaica Braun.	24	1
Silene keiskei Miq.	24	2
S. repens Patrin. var. *latifolia* Turcz.	48	2
S. struthioloides Gray	24	1
S. species from Nepal	24	2

DISCUSSION

Having determined chromosome numbers for all but five of the thirty-three perennial species of *Silene* native to western North America, I am emboldened to make some guarded generalizations. Though chromosome numbers of the remaining uncounted species as well as any additional records for species previously counted may prove to be further exceptions, it seems safe to state that the tetraploid level ($2n=48$) is by far the common one among the western species. The tetraploid level is maintained even more rigidly for the eastern North American species. Apart from *S. ovata* and *S. nivea* (Nutt.) Otth., for which chromosome numbers are not yet known, the other seven eastern perennial species are uniformly tetraploid. The present data emphasize the observation made in an earlier paper (Kruckeberg, 1954)—namely, that North America is the home of the polyploids whereas the continental areas of Eurasia are inhabited predominantly by diploid species. At first glance, this geographic difference in average ploidy level might suggest that the Eurasian species were ancestral to the North American ones. The Siberia-Aleutian Islands land bridge, a path well beaten by the biogeographers—if not by the biota themselves--would seem the likely route. Yet one species for which I have obtained counts on both the Asian and North American plants defies the usual west-to-east migration route. *Silene repens* Patrin in Japan (var. *latifolia* Turcz.) is tetraploid while the North American variety, *australe* Hitch. & Maguire, is diploid. Therefore, I would offer an alternative hypothesis: North American polyploid species could have originated on this continent from diploids as a common phenomenon whereas polyploidy might have been a rare event among the ancestors of the Eurasian Silenes.

The present list of chromosome numbers permits tentative conclusions to be drawn about certain species.

1. SILENE CALIFORNICA DUR. AND S. HOOKERI NUTT. On morphological grounds it is easy to see a close relationship between *S. californica* and *S. hookeri*. The prostrate habit, the showy flowers (red versus pink), the characteristic geniculation of the pedicels in fruit, the large black seeds, and the partial sympatric distribution in the Coast Ranges and Siskiyou Mountains all suggest a close affinity. Up to now, though, I was convinced that the two species were isolated by a barrier of ploidy difference. *S. hookeri* is consistently hexaploid ($2n=72$) while most collections of *S. califorinca* have been tetraploid ($2n=48$). The discovery of a hexaploid *S. californica* population and the subsequent production of a fertile F_1 hybrid (to be discussed in a later paper) support my intuitive feeling that the two species are closely related.

2. THE THREE SUBSPECIES OF SILENE LACINIATA CAV. According to Hitchcock and Maguire (1943), three regional facies of *S. laciniata* occur in the southwest. *Silene laciniata* subsp. *laciniata* is widespread in Mexico, *S. laciniata* subsp. *major* H. & M. is confined to coastal southern California, and *S. laciniata* subsp. *greggii* (Gray) H. & M. occurs in Arizona, New Mexico, Texas, and adjacent northern Mexico. Subspecies *major* is octoploid ($2n=96$) while subsp. *greggii* is tetraploid ($2n=48$). Much wider sampling of this polymorphic species will be necessary before it can be fully evaluated cytotaxonomically. Since subsp. *major* and subsp. *greggii* are isolated both spatially and genetically, it becomes a moot question as to whether subsp. *greggii* should be restored to its former level of

species. The center of distribution of *S. laciniata* is undoubtedly in the plateau and mountain regions of north-central Mexico. Subspecies *greggii* is a mid-continent derivative from this center while subsp. *major* is the coastal segregate. Additional collections of *S. laciniata greggii,* made in Arizona, New Mexico, and Texas in the summer of 1959, proved also to be tetraploid. However, in the two weeks of searching in the Mexican states of Nuevo León and Chihuahua, I did not encounter any plants of *S. laciniata,* though the species is frequently reported from this section of México.

3. Diploid and tetraploid Silene menziesii Hook. Further sampling of this wide-ranging species reaffirms my earlier report (Kruckeberg, 1954) of the predominance of the tetraploid level ($2n=48$). As against twelve collections of tetraploids, only two diploid samples are recorded in this current listing. One of the diploids was collected in the Sierra Nevada of California and the other in central Idaho. It would appear that the distribution of diploids is random and their occurrence rare. It is possible that the tetraploids are autoploid in origin. The sporadic distribution of the diploids, plus the not infrequent occurrence of quadrivalent pairing in certain tetraploids lends support to this hypothesis. Amphiploid origin is less likely, even though the Idaho diploids do occur sympatrically with another diploid species, *S. repens* Patrin subsp. *australis* H. & M. Apart from being rhizomatous and having general vegetative similarity, North American *S. repens* is not too likely a parent for tetraploid *S. menziesii.*

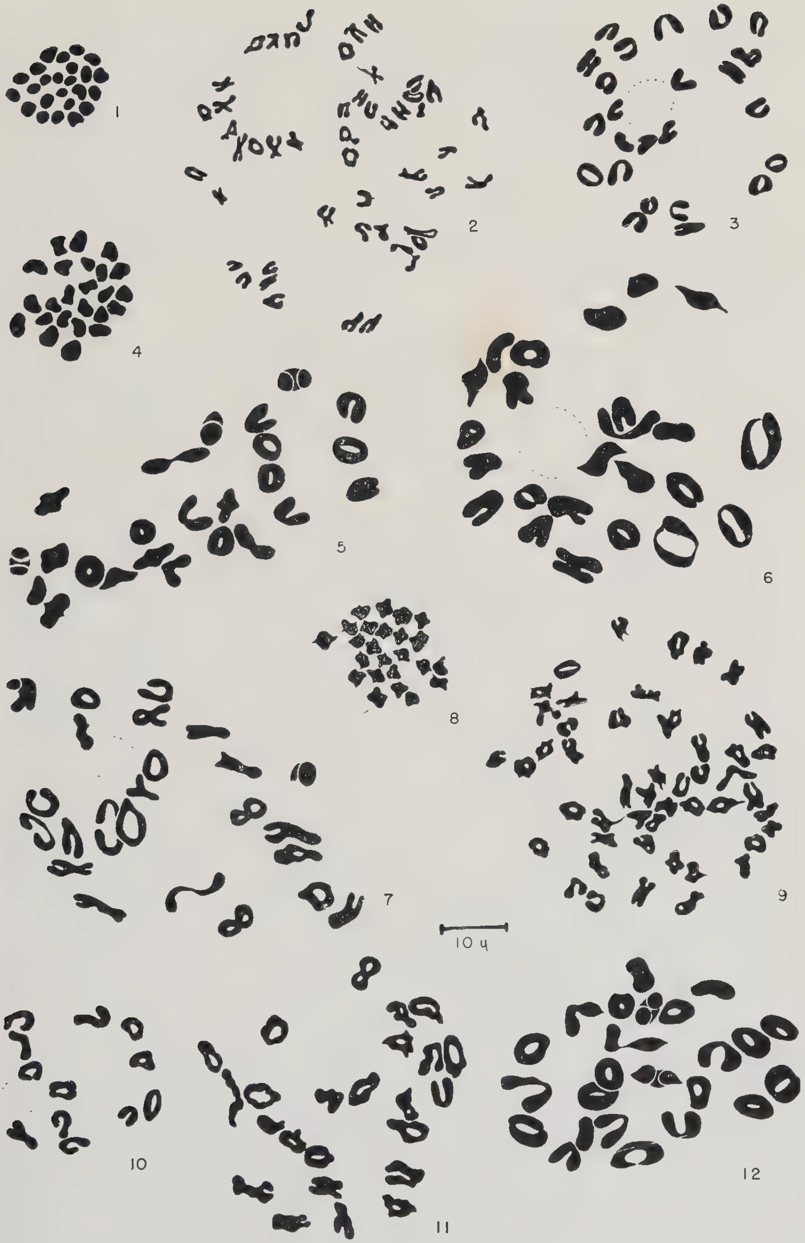
4. Tetraploid and octoploid Silene parryi (Wats.) H. & M. With the present data it is now possible to define rather clearly the limits of the two ploidy levels in *S. parryi.* The tetraploid forms ($2n=48$) occur exclusively east of the crest of the Cascade Range, and then eastward to the mountains of northeastern Washington (and presumably northern Idaho), terminating in the Rocky Mountains of Montana and Canada[2]. The octoploid segment ($2n=96$) of the species has a much more restricted distribution; as yet it has been found only along the Cascade Range and the Olympic Mountains of Washington.

---

[2] A collection of a tetraploid *parryi* made on Snowdrift Mountain in southern Idaho (*Kruckeberg 4520*) suggests that the tetraploid form extends southward along the Continental Divide.

Explanation of Figures 1–12

Figs. 1–12. Chromosomes of *Silene* microsporocytes. Fig. 1. *S. aperta,* II M (*Kruckeberg 3407*). Fig. 2. *S. clokeyi,* Diak. (*Kruckeberg 3911*). Fig. 3. *S. grayi,* Diak. (*Kruckeberg 3772*). Fig. 4. S. *invisa,* I M (*Kruckeberg 2897b*). Fig. 5. *S. laciniata greggii,* Diak. (*Kruckeberg 3878*). Fig. 6. *S. lemmonii,* Diak. (*Kruckeberg 3530*). Fig. 7. *S. montana,* Diak. (*Kruckeberg 3529*). Fig. 8. *S. occidentalis,* I T (*Kruckeberg 3696*). Fig. 9. *S. petersonii,* Diak. (*Kruckeberg 3904*). Fig. 10. *S. repens australis,* Diak. (*Kruckeberg 4290*). Fig. 11. *S. scaposa,* Diak. (*Kruckeberg 4031*). Fig. 12. *S. spaldingii,* Diak. (*Daubenmire, s.n.*). Diak., diakinesis; I M, first metaphase; II M, second metaphase; I T, first telophase. →



FIGS. 1–12. Chromosomes of *Silene* microsporocytes.

5. Silene williamsii Britt., S. seeleyi Mort. & Thomps., and S. menziesii Hook. These three species are grouped together because of their close morphological kinship. *Silene williamsii* of central Alaska and *S. seeleyi* are both diploid so far as is known. The fact that some collections of *S. menziesii* are also diploid makes gene exchange among the three species potentially possible. Hitchcock and Maguire (1947, p. 48) speculate that exceptional specimens of *S. menziesii* from western Canada show "contamination" with *S. williamsii*. I have made artificial hybrids in various combinations with the three diploids; some of the hybrids are reasonably fertile. Details of these and other interspecific hybridizations will be discussed elsewhere.

Geographic Distribution of Collections

The origin of each collection that provided a chromosome count is given below. All collections are represented by specimens deposited in the University of Washington Herbarium. To those botanists who collected living plant material for this study, the author wishes to express his sincere appreciation.

Western North American Species

Lychnis drummondii (Hook.) Wats. 2n=48. Arizona. Apache County: 12 miles from Red Rock, Lukachukai Mountains, *Gould* and *Phillips 4835*. Coconino County: Head of Kaibab Trail, north rim of Grand Canyon, *Kruckeberg 3901*. Nevada. Clark County: ridge along trail to Charleston Peak, *Kruckeberg 3910*. New Mexico. Catron County: between Bursom Forest Camp and Willow Creek, Mogollon Mountains, *Kruckeberg 4658;* 5 miles northeast of Collins Park on road to the plains of St. Augustine, *Kruckeberg 4702*.

Silene aperta Greene. 2n=48. California. Tulare County: 1 mile west of Hockett Meadows, on trail to Atwell Mill, Sequoia National Park, *Kruckeberg 3407*.

Silene bridgesii Rohrb. 2n=48. California. Tuolumne County: Hog Ranch, near Mather, *Pray s.n.*

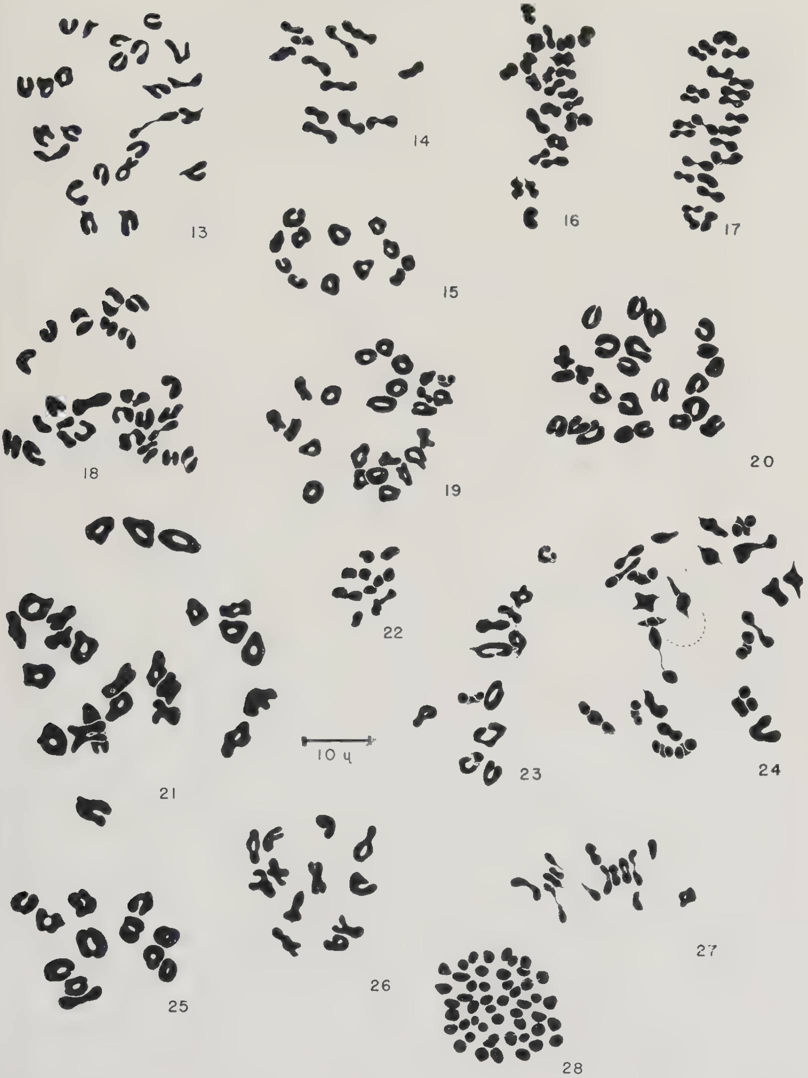
Silene californica Durand. 2n=48. Tetraploid. California. Tulare County: Echo Point, near Moro Rock, Sequoia National Park, *Kruckeberg 3394*. Mendocino County: 4 miles north of Laytonville on U. S. Highway 101, *Kruckeberg 3918*.

Silene californica Durand. 2n=72. Hexaploid. California. Del Norte County: gravel bar along Smith River at Gasquet, *Kruckeberg 3919*.

Silene campanulata Wats. 2n=48. California. Siskiyou County: 12 miles southwest of Etna on Somes Bar road, *Hitchcock 20237*.

Silene clokeyi H. & M. 2n=96. Nevada. Clark County: along ridge, 2 miles from summit of Charleston Peak, *Kruckeberg 3911*.

Silene douglasii Hook. 2n=48. California. Plumas County: rocky flats above Elwell Lake, *Kruckeberg 2897;* rocky flats between Sand Lake and Packer Lake, near Sierra Buttes, *Kruckeberg 3697*. Trinity County: granite talus at Emerald Lake, Trinity Alps, *Kruckeberg 3743;* gravelly alluvium near Portugese Camp between Emerald Lake and Morris Meadows, Trinity Alps, *Kruckeberg 3744*. Oregon. Benton County: grassy summit of Marys Peak, *Kruckeberg 2918*. Multnomah County: Larch Mountain, *Mrs. Mackaness, s.n.;* Bonneville, *Hitchcock s.n.* Clackamas County: ridge 0.5 miles east of Devils Peak, *Kruckeberg 4006*. Idaho. Idaho County: Indian Hill lookout above Selway River, *Kruckeberg 4095*; granitic slopes above Canteen Meadows, Crags Mountains, *Kruckeberg 4137*; southeastern granitic rim of Crags Mountains, *Kruckeberg 4140*. Valley-Custer county line: rock crevices, Cape Horn Mountain, *Kruckeberg 4177*. Custer County: 2 miles east of Toxaway Lake, Sawtooth Mountains, *Kruckeberg 4198;* talus about Wild Horse Lakes, Mount Hyndman area,



Figs. 13–28. Chromosomes of *Silene* microsporocytes. Fig. 13. *S. thurberi,* Diak. (*Kruckeberg 3863*). Fig. 14. *S. williamsii,* I M (Donnelly Dome, *Gjaerevoll, s.n.*). Fig. 15. *S. antirrhina,* Diak. (*Palmer, s.n.*). Fig. 16. *S. caroliniana,* I M (*Channell, s.n.*). Fig. 17. *S. caroliniana wherryi,* I M (*Epstein, s.n.*). Fig. 18. *S. polypetala,* Diak. (*Galle, s.n.*). Fig. 19. *S. regia,* Diak. (G. W. Carver National Monument, *Palmer, s.n.*). Fig. 20. *S. rotundifolia,* Diak. (*Sherman, s.n.*). Fig. 21. *S. subciliata,* Diak. (*Dormon, s.n.*). Fig. 22. *Lychnis wilfordii,* II M (*Alpine Garden Society 1280*). Fig. 23. *Silene keiskei,* I M (Mount Ho-o, *Ozawa, s.n.*). Fig. 24. *S. repens latifolia,* Diak. (*Roberson, s.n.*). Fig. 25. *S. struthiloides,* Diak. (*Bryan, s.n.*). Fig. 26. *Silene* sp., Diak. (*Stainton Sykes & Williams 8108*). Fig. 27. *Silene* sp., I M (*Stainton Sykes & Williams 8178*). Fig. 28. *S. wrightii,* I M, *Kruckeberg 4716.* Diak., diakinesis; I M, first metaphase; II M, second metaphase.

Kruckeberg 4252. Washington. Chelan County: Basalt ridge above Liberty, *Kruckeberg A209;* Icicle Creek, *Hitchcock 20190.* Okanogan County: between Twisp and Omak on Loup-Loup highway, *Kruckeberg 3274;* summit of Loup-Loup highway, *Kruckeberg 3276;* 5 miles west of Wauconda on highway to Republic, *Kruckeberg 3279.* Skamania County: 1 mile southeast of Timberline Camp on Timberline Trail, Mount Saint Helens, *Kruckeberg 3992.* Stevens County: summit of Chewelah ski lift on road to Chewelah Peak, *Kruckeberg 4052;* between ski lift summit and Chewelah Peak, on open ridges, *Kruckeberg 4057.*

Silene grayi Wats. 2n=48. California. Trinity County: between Deer Creek basin and Deer Lake, Trinity Alps, *Kruckeberg 3759;* between Deer Creek Pass and Stonewall Pass, Trinity Alps, *Kruckeberg 3766;* 3.5 miles above Trinity Alps resort on Red Mountain trail below Stonewall Pass, *Kruckeberg 3772.*

Silene hookeri Nutt. ex T. & G. 2n=72. Oregon. Benton County: between Kings Valley and Wren, *Kruckeberg 2697.* Douglas County: 5 miles up Little River, south of Glide, *Cohen s.n.* Josephine County: peridotite alluvium bordering Whiskey Creek, 3 miles west of Obrien, *Kruckeberg 3777.*

Silene invisa H. & M. 2n=48. California. Plumas County: rocky flats above Elwell Lake, Lakes Basin area, *Kruckeberg 2897b;* rocky swales above Upper Tamarack Lake, Sierra Buttes area, *Kruckeberg 3694.* Trinity County: wooded slope between Deer Creek basin and Deer Lake, Trinity Alps, *Kruckeberg 3759a.*

Silene laciniata Cav. subsp. major H. & M. 2n=96. California. Los Angeles County: west of Beverly Glen Canyon on Mulholland Drive, Santa Monica Mountains, *Snow s.n.;* Turnbull Canyon, Whittier, *Raven s.n.* San Diego County: 0.5 mile east of Potrero Store along State Highway 94, *Walters s.n.* Santa Barbara County: Bishop Ranch, *Clarke s.n.*

Silene laciniata Cav. subsp. greggii (Gray) H. & M. 2n=48. Arizona. Apache County: at crossing of west fork Little Colorado River, between Greer and junction with Highway 73, *Kruckeberg 4608.* Cochise County: along Rustler Park road, Chiricahua Mountains, *Kruckeberg 3862*; rocky banks of Cave Creek, at Herb Martyr Forest Camp, Chiricahua Mountains, *Kruckeberg 3863*; between Rustler Park and Barfoot Lookout, *Kruckeberg 4643;* Crest Trail to Fly Peak, south of Rustler Park, Chiricahua Mountains, *Kruckeberg 4650.* Graham County: rocky slopes, 4 miles below Hospital Flats, Graham Mountains, *Kruckeberg 3878.* New Mexico. Catron County: ten miles northeast of Collins Park on road to Datil, *Kruckeberg 4703.* Grant County: rocky slopes overlooking copper mines at Santa Rita, *Kruckeberg 4721.* Texas. Brewster County: between Boot Springs and pass overlooking Inner Basin, Big Bend National Park, *Kruckeberg 4776.*

Silene lemmonii Wats. 2n=48. California. Tulare County: above Lodgepole Camp on road to corral, Sequoia National Park, *Kruckeberg 3393.* Tuolumne County: grade east of Yosemite Creek along Tioga Pass Road, *Kruckeberg 3530.* Sierra County: along State Highway 89 at Calpine Lookout road, *Kruckeberg 3667.* Plumas County: woods at junction of Susanville and Lake Almanor roads, State Highway 89, *Kruckeberg 3702.* San Bernardino County: woods along road from South Fork of Santa Ana River to Barton Flats, *Kruckeberg 3846.*

Silene marmorensis Kruck. 2n=48. California. Siskiyou County: one mile north of Somes Bar on road to Camp Three, *Hitchcock 20221*, type.

Silene menziesii Hook. 2n=24. Diploid. California. Fresno County: Jackass Meadows Forest Camp, below Florence Lake, *Kruckeberg 3436.* Idaho. Custer County: 2 miles above Wild Horse Creek Forest Camp, *Kruckeberg 4265.*

Silene menziesii Hook. 2n=48. Tetraploid. Oregon. Wallowa County: Evergreen Forest Camp, upper Imnaha River, *Kruckeberg 3120.* California. Trinity County: upper end of Morris Meadows, Stuart Fork of Trinity River, Trinity Alps, *Kruckeberg 3746.* Idaho. Valley County: lower Bear Valley at Poker Meadows Campground, *Kruckeberg 4192.* Custer County: Wild Horse Creek Forest Camp, *Kruckeberg 4292.* Bear Lake County: on tailings of phosphate mine, west slope of Snowdrift Mountain, *Kruckeberg 4527.* Custer County: 10 miles west of Challis, on talus of upper

Daugherty Gulch, *Kruckeberg 4542*. WASHINGTON. Chelan County: 1 mile east of U. S. Highway 10 on State Highway 15C to Lake Wenatchee, *Kruckeberg 3259*. Kittitas County: along Swauk Creek, ⅛ mile below Liberty Guard Station, *Kruckeberg 3010*; base of Iron Peak trail, North Fork Teanaway River, *Kruckeberg 3289*. Okanogan County: rocky alluvium of Methow River, 2 miles below Mazama, *Kruckeberg 3273*; Sweat Creek Forest Camp, 7 miles west of Republic, *Kruckeberg 3283*. Stevens County: along trail between Calispell Meadows and Calispell Peak, *Kruckeberg 4081*.

SILENE MONTANA Wats. 2n=48. CALIFORNIA. Tuolumne County: along Tioga Pass road between Tamarack Flats and Yosemite Creek, *Kruckeberg 3529*. Shasta County: between Chaos Jumbles and Noble Pass, Lassen Volcanic National Park, *Kruckeberg 3713*. OREGON. Klamath County: slopes above Rim Drive, 3 miles above Park Headquarters, Crater Lake National Park, *Kruckeberg 3780*. NEVADA. Ormsby County: along U. S. Highway 50, east of Spooner Summit, 10 miles west of Carson City, *Kruckeberg 3652*.

SILENA NUDA (Wats.) H. & M. 2n=48. CALIFORNIA. Sierra County: 1 mile east of Calpine on road to Beckwourth, *Kruckeberg 3664*. Plumas County: 1 mile west of Portola along U. S. Highway 40, *Kruckeberg 3669;* 3 miles northwest of Lake Almanor along State Highway 89, *Kruckeberg 3700*.

SILENE NUDA (Wats.) H. & M. subsp. INSECTIVORA (Hend.) H. & M. 2n=48. OREGON. Klamath County: Sprague River valley, 7.5 miles west of Bly along State Highway 66, *Kruckeberg 4030* (type locality).

SILENE OCCIDENTALIS Wats. 2n=48. CALIFORNIA. Sierra County: timbered rocky flats between Sand Lake and Packer Lake, Sierra Buttes area, *Kruckeberg 3696*.

SILENE OREGANA Wats. 2n=48. IDAHO. Valley County: Lodgepole pine flats 5 miles west of McCall on highway to New Meadows, *Kruckeberg 4151*.

SILENE PARISHII Wats. 2n=48. CALIFORNIA. San Bernardino County: Grout Bay, Big Bear Lake, *Everett 8248, Kruckeberg 3831;* 2 miles above road's end, along trail to Mount San Gorgonio, *Kruckeberg 3848*.

SILENE PARRYI (Wats.) H. & M. 2n=48. Tetraploid. IDAHO. Bear Lake County: open, west-facing slopes of Snowdrift Mountain, *Kruckeberg 4520*. WASHINGTON. Chelan-Kittitas County line: Mount Lilian, eastern Wenatchee Mountains, *Kruckeberg 3229, 3232*. Stevens County: between head of ski lift and summit, Chewelah Peak road, *Kruckeberg 4056;* ¾ mile below lookout, Chewelah Peak, *Kruckeberg 4064;* southwest-facing slopes of Calispell Peak, *Kruckeberg 4072;* open ridge ¾ mile south of Calispell Peak, *Kruckeberg 4079*. MONTANA. Flathead County: east slopes of Mount Aeneas, Swan River Range, *Kruckeberg 4306*. Glacier National Park: just south of Logan Pass, on rocky ledges of "Hanging Gardens," *Kruckeberg 4340*. CANADA. Waterton Lakes National Park, Alberta: east-facing slope above upper Carthew Lake, on trail between Cameron Lake and Waterton Lake, *Kruckeberg 4366*.

SILENE PARRYI (Wats.) H. & M. 2n=96. Octoploid. WASHINGTON. Clallam County (Olympic National Park): at Idaho Shelter, Hurricane Ridge, *Kruckeberg 2776, 4045;* along ridge to Mount Angeles, *Kruckeberg 2792;* along trail to Moose Lake from Obstruction Point, *Kruckeberg 4048*. Kittitas County: alluvial flats at Fish Lake, upper Cle Elum River, *Kruckeberg 3221;* at base of Iron Peak trail, North Fork of Teanaway River, *Kruckeberg 3288;* along upper reaches of Miller Peak trail, *Kruckeberg 3967*.

SILENE PETERSONII Maguire. 2n=96. UTAH. Garfield County: on slopes of red talus and clay, 5.5 miles east of U. S. Highway 89, on Red Canyon road to Bryce Canyon National Park, *Kruckeberg 3904*. Iron County: limestone clay along west-facing rim of Cedar Breaks, *Kruckeberg 3908*.

SILENE REPENS Patrin. subsp. AUSTRALE H. & M. 2n=24. Diploid. IDAHO. Custer County: Boulder Creek, 5 miles above Wildhorse Creek Canyon, *Kruckeberg 4286a;* Boulder Creek basin, 0.5 mile below Boulder Lake, *Kruckeberg 4290*.

SILENE SARGENTII Wats. 2n=48. CALIFORNIA. Fresno County: pass between upper Bear Creek Meadow and Rose and Marie Lakes, *Kruckeberg 3459;* at Marie Lake, *Kruckeberg 3482*. Shasta County: near summit of Lassen Peak, Lassen Volcanic National Park, *Kruckeberg 3711*.[3]

SILENE SCAPOSA Robins. 2n=48. OREGON. Harney County: 1 mile north of Squaw Butte on dirt road to U. S. Highway 20 (Burns-Bend highway), *Kruckeberg 4031*.

SILENE SCOULERI Hook. 2n=48. IDAHO. Benewah County: between Tensed and Potlatch on U. S. Highway 95, *Kruckeberg 4085*.

SILENE SPALDINGII Wats. 2n=48. WASHINGTON. Garfield County: near Colton, *Daubenmire s.n.*

SILENE THURBERI Wats. 2n=48. ARIZONA. Cochise County stony alluvium along Cave Creek at Herb Martyr Forest Camp, Chiricahua Mountains, *Kruckeberg 3863*.

SILENE VERECUNDA Wats. subsp. VERECUNDA 2n=48. CALIFORNIA. San Francisco County: rocky soil at east end of summit ridge of Mount Davidson, *Raven s.n.*

SILENE VERECUNDA Wats. subsp. ANDERSONII (Clokey) H. & M. 2n=48. NEVADA. Clark County: rocky alluvium of Kyle Creek canyon, 1 mile below Charleston Park, Charleston Mountains, *Kruckeberg 3915*.

SILENE VERECUNDA Wats. subsp. PLATYOTA (Wats.) H. & M. 2n=48. CALIFORNIA. Tulare County: Last Chance Meadows area, Sierra Nevada Range, *Kruckeberg 3345;* 7 miles above California Hot Springs on road to Johnsondale, *Kruckeberg 3392;* 5 miles west of Hockett Meadows, Sequoia National Park, *Kruckeberg 3422a*. Los Angeles County: north slope of Mount Waterman, San Gabriel Mountains: *Kruckeberg 3821*; Horse Flats, San Gabriel Mountains, *Kruckeberg 3822*; north-facing slopes of Blue Ridge, San Gabriel Mountains, *Kruckeberg 3916*. San Bernardino County: 5 miles below Lake Arrowhead on State Highway 18; flats above Moon Ridge, south side of Bear Valley on road to south fork Santa Ana River, *Kruckeberg 3840* (eglandular form); near summit of Sugarloaf Ridge, 6 miles southeast of Bear Valley, *Kruckeberg 3843* (eglandular form). Riverside County: 3.4 miles south and east of State Highway 74, Bautista Canyon, *Vasek s.n.*

SILENE WILLIAMSII Britt. 2n=24. ALASKA. Slopes of Shaw Creek, Richardson Highway, *Gjaerevoll 1444*; heath, Donnelly Dome, Alaska Range, *Gjaerevoll 1284*.

SILENE WRIGHTII Gray. 2n=96. NEW MEXICO. Grant County: in crevices of massive boulders at base of sheer rock cliffs, overlooking copper mines at Santa Rita, *Kruckeberg 4716*.

EASTERN NORTH AMERICAN SPECIES

SILENE ANTIRRHINA L. 2n=24. MISSOURI. Jasper County: near Webb City, *Palmer s.n.*

SILENE CAROLINIANA Walt. 2n=48. NORTH CAROLINA. Franklin County: 9 miles east of Wake Forest, granitic "flat-rock" area, *Channell s.n.* Orange County: Chapel Hill, *Bell s.n.*

SILENE CAROLINIANA Walt. subsp. WHERRYI (Small) Clausen. 2n=48. Garden culture: Larchmont, New York, *Epsein s.n.*

SILENE POLYPETALA (Walt.) Fern. and Schub. 2n=48. GEORGIA. Talbot County: north of county bridge, hillside above Flint River, *Galle s.n.*

SILENE REGIA Sims. 2n=48. MISSOURI. Dade County: near South Greenfield, *Palmer s.n.* Newton County: George Washington Carver National Monument, *Palmer s.n.*

SILENE ROTUNDIFOLIA Nutt. 2n=48. TENNESSEE. Marion County: crevices of the "Chimneys," gorge of Pocket Creek, Whitwell Pocket area, *Sherman s.n.*

SILENE STELLATA (L.) Ait. [including *S. scabrella* (Nieuwl.) Palm. and Steyerm.] 2n=48. INDIANA. Starke County: *Jackson s.n.* MISSOURI. Newton County: near Diamond, George Washington Carver National Monument, *Palmer s.n.* KANSAS. Riley County: 40 miles east of Aurora, woods along Fancy Creek, *Fraser*. WEST VIRGINIA. Monongalia County: on Permian shale banks, vicinity of Morgantown, *Constable & Core s.n.* LOUISIANA. northwestern portion of state, *Dormon s.n.*

---

[3] Plants intermediate between *S. sargentii* and *S. Suksdorfii* Robins.

Silene subciliata Robins. 2n=48. Louisiana. "Western Louisiana," *Dormon s.n.* (garden culture).

Silene virginica L. 2n=48. North Carolina. Wake County: 18 miles north of Raleigh, across the Neuse River, on State Highway 50, *Smith s.n.*

Species outside Continental North America

Lychnis wilfordii Maxim. 2n=24. Japan: Garden culture, *M. Ozawa s.n.;* garden culture, *Alpine Garden Society 1280.*

Petrocoptis pyrenaica Braun. 2n=24. Europe. Garden culture, *Museum of Natural History, Paris s.n.*

Silene keiskei Miq. 2n=24. Japan: Mt. Ho-o, *M. Ozawa s.n.*; Mt. Kitadake, *Ozawa s.n.*

Silene repens Patrin. var. latifolia Turcz. 2n=48. Japan: Garden culture, *Mrs. L. N. Roberson s.n.;* garden culture, *Epstein s.n.*

Silene struthioloides Gray. 2n=24. Hawaii. Hawaii: near the Kilauea Crater, Hawaii National Park, *Bryan s.n.*

Silene species. 2n=24. Nepal: Tegar, north of Mustang, *Sykes & Williams 8108*; Larjung, south of Tukucha, Kali Gandaki Valley, *Sykes & Williams 8178.*

Department of Botany,
University of Washington, Seattle

Literature Cited

Hitchcock, C. L., and B. Maguire. 1947. A revision of the North American species of Silene. Univ. Wash. Publ. Biol. 13:1–73.

Kruckeberg, A. R. 1954. Chromosome numbers in Silene (Caryophyllaceae): I. Madroño 12:238–246.

————. 1955. Interspecific hybridizations of Silene. Am. Jour. Bot. 42:373–378.

————. 1960. A new Silene from northwestern California. Madroño 15:172–177.

A NEW SPECIES OF ZINNIA FROM MEXICO

A. M. Torres

During the course of a cytotaxonomic study of the genus *Zinnia* (Compositae), plants started from seeds kindly provided by Dr. Jerzy Rzedowski of the Universidad Autónoma de San Luis Potosí, México, were cultivated in the greenhouses of Indiana University. One collection, when grown to maturity, proved to be a new species known thus far only from the area where the seeds were collected.

Zinnia citrea sp. nov. Planta perennis, cespitosa, ad 2 dm. alta; caulibus viridibus, strigosis; foliis oppositis, amplexicaulibus, uninervis, linearibus, ad 3.5 cm. longis, 0.8–1.9 mm. latis, sparse strigosis aut glabrescentibus, sparse glanduloso-punctatis; capitulis terminatibus in pedunculis 0.8–2.0 cm. longis, subhemisphaericis, 0.4 cm. latis 0.5 cm. altis; phyllariis oblongis, firme-gradatis, herbaceis, minuto-glanduliferis, apicibus obtusis, ciliatis; radiis ca. 7, chloreis oblongis, ad 0.8 cm. longis 0.5 cm. latis, sine tubo, in dorso viridis nervis, apicibus 0.3 lobis; achaeniis radiorum oblanceolatis, ad 4.2 mm. longis, tuberculatis, nigrescentibus, sine aristis; floribus disci ca. 22, tubis 3.1 mm. longis, lobis 1.4 mm.

longis, intus lobis lanuginosis, supra flavo-viridibus, infra viridibus; achaeniis disci oblanceolatis, compressis, ad 2.6 mm. longis, sparse ciliatis vel vere glabris, marginibus ciliatis, pappis 2 inaequalis aristatis; receptaculi paleis lanceolatis, scariosis, apicibus acutis minuto-dentatis, plus minusve viridibus; receptaculis convexis.

Plants perennial, cespitose, about 2 dm. high; stems green, strigose; leaves opposite, sheathing, one-nerved, linear, about 3.5 cm. long, 0.8–1.9 mm. wide, sparsely strigose or becoming glabrous, attenuate, sparsely glandular-punctate; heads terminal on peduncles 0.8–2.0 cm. long, subhemispherical, 0.4 cm. wide, 0.5 cm. high; phyllaries oblong, strongly graduated, herbaceous, apices obtuse, ciliate, minutely glandular; rays about 7, lemon-colored, oblong, about 0.8 cm. long, 0.5 cm. wide, tubeless, green-nerved on the back, apices 0–3 lobed; ray achenes oblanceolate, about 4.2 mm. long, tuberculate, becoming black, awnless; disk flowers about 22, the tube 3.1 mm. long, the lobes 1.4 mm. long, velvety on inner surface, yellow-green above, green below; achenes of the disk oblanceolate, compressed, 2.6 mm. long, sparsely ciliate or essentially glabrous, the margins ciliate, the pappus of 2 unequal awns; pales of the receptacle lanceolate, scarious, the apices acute, minutely dentate, more or less green; receptacle convex.

Type. Mexico. Seed collected near Santo Domingo, municipality of Guadalcazar, San Luis Potosí, on deep alluvial soil with *Prosopis*. Elev. 1200 m. Cultivated in greenhouse, Indiana University, 1959, *Torres 139* (IND).

Zinnia citrea is very closely allied morphologically, but entirely distinct from *Z. grandiflora* Nutt. and *Z. acerosa* (DC.) Gray (considered by the writer to include *Z. pumila* Gray). *Zinnia grandiflora* occurs in the southwestern United States as far north as Kansas, and in the Mexican states of Sonora, Chihuahua, Coahuila and Durango. *Zinnia acerosa* is found in the southern parts of Arizona and New Mexico, western Texas, and the adjacent portions of México as far south as Durango, Zacatecas and San Luis Potosí.

Some of the differences between the three species are indicated below.

	Z. citrea	*Z. acerosa*	*Z. grandiflora*
Number of leaf nerves	1	1	3
Ray color	lemon	white	yellow
Number of rays	5–7	4–6	3–6
Number of disk flowers	18–25	8–13	18–24
Chromosome no.	$n = 20$	$n = 10$ $n = 19$ $n = 20$	$n = 21$ $2n = 42$

Compared with *Z. citrea*, the rays of *Z. grandiflora* are yellow, usually fewer and considerably larger; the disk is red or sometimes green, instead of yellowish; the leaves are wider and longer but quite variable; the somatic chromosome number is 42. Jackson (1959) has reported a gametic chromosome number is 21 and the somatic chromosome number is 42. Jackson (1959) has reported a gametic chromosome number of 24 for *Z. grandiflora*. The rays of *Z. acerosa* are white (drying pale yellow), generally fewer, slightly larger and the disk is reddish. Populations having gametic chromosome numbers of 10, 19, and 20 have been found. Voucher herbarium specimens for the chromosome counts are deposited at Indiana University.

Department of Botany
Indiana University
Bloomington, Indiana

LITERATURE CITED

JACKSON, R. C. 1959. Documented chromosome numbers of plants. Madroño 15:52.

A COMMENT ON COLD SUSCEPTIBILITY OF PONDEROSA AND JEFFREY PINES

WILLIS W. WAGENER[1]

Dr. Haller's recent paper[2] on factors affecting the distribution of ponderosa and Jeffrey pines prompts a supplementary note concerning the comparative effects of low temperatures observed on the two species in northeastern California. In this region extensive mixed stands of the two occur, many of them above the 5,000-foot level, providing a convenient comparison of their reactions to environmental conditions for the geographical races represented there.

Dr. Haller considers that *Pinus jeffreyi* is more tolerant than *P. ponderosa* of extremes of low temperature and aridity, but he concludes that the differential limiting effect of low temperature must be exerted in the seedling stage or on young trees because mature trees of *P. ponderosa* at its upper altitudinal limit appear vigorous and show no evidence of stunting. My observations over the past 25 years, following periods of severe cold, fail to indicate any material difference between the two species in their ability to withstand extreme cold, either as young or mature trees.

In January 1937, California experienced two very cold periods, particularly east of the Sierra Nevada crest. The first of these was from January 8 to 10 and the second from January 20 to 25. The lowest temperature reported to the United States Weather Bureau for these periods in California was −45°F. at Boca, California, on January 20.

Early in February a belt of pronounced damage to pines and other vegetation became noticeable along the east face of the Sierra Nevada for almost its entire length. At the north end it was narrow, from 25 to

---

[1] Forest Pathologist, Pacific Southwest Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture.

[2] Haller, John R. Factors affecting the distribution of ponderosa and Jeffrey pines in California. Madroño 15:65–71. 1959.

200 yards wide, depending on slope, and occurred at an elevation of about 4,800 feet. Toward the south the belt was wider and was located at a gradually increasing elevation, between 7,000 and 8,000 feet at the south end.

From the Truckee River southward the damage to pines consisted largely of foliage browning, from which practically all the trees later recovered. On the slope above Long Valley Creek, Lassen County, however, damage was much more pronounced, and many mature pines, as well as trees of younger ages, failed to recover. Mortality in the pines ran as high as 75 percent.

In the topographic gap created by the Susan River the belt-like character of the zone of damage was less evident but the major injury was found at approximately the same elevation as above Long Valley Creek. A strong temperature inversion apparently occurred at this level. On low benches along the Susan River a number of cases were observed where the lower foliage of young Jeffrey pines 20 to 30 feet in height was almost completely killed, whereas that of the upper crowns on the same trees was only slightly damaged. In addition, many of the trees showed browning of the phloem tissues of the inner bark of the lower trunks and branches. Most of these trees died later. The immediate cause of death appeared to be the activities of bark insects attracted by the killed phloem. Whether the trees could have survived in the absence of the insects was not determined.

In Jeffrey pine the spread between noticeable injury to foliage and the complete killing of foliage and branches or trunks appeared to be very much narrower than in ponderosa pine. Cases were noted in which foliage on ponderosa pines was almost completely killed, but nearly all buds and twigs remained alive and produced fairly good growth the following season. This was not true for Jeffrey pines. In them, severe foliage injury was accompanied by severe bark injury, and no recovery followed. Where both species were present in the same location there was less mortality in the ponderosa than in the Jeffrey pines.

Another series of abnormally low temperatures prevailed in California in January, 1949. Minima of −38°F. were registered at Boca, California, on the 25th and of −31°F. at Alturas and Bridgeport Dam on the 26th.

Damage to pines on low ground east of the Sierra Nevada as a result of this series of cold waves during the month was much more general in occurrence than in 1937. Heavy browning of foliage of young ponderosa and Jeffrey pines on the borders of low flats or along stream bottoms was noted in interior basin drainages from Modoc County to the San Bernardino Mountains. Stringers of pines along stream courses extending into the Honey Lake and Carson valleys were heavily damaged, and many trees eighteen to twenty inches in diameter breast high later succumbed. These were mostly Jeffrey pines but some ponderosa pines were present also. Mortality in them appeared to be no greater in proportion than in the Jeffrey. Recovery in young trees appeared to depend on whether or not the inner bark tissues of the main stem had been injured. Killing of these tissues was found both in ponderosa and Jeffrey pines, with later mortality after the stems had been invaded by bark-feeding insects.

Neither in 1937 nor in 1949 was enough difference in mortality from the abnormal cold noted between established trees of the two species to account for the tendency of Jeffrey pine to be confined to the higher elevations or colder situations. If an ecologically significant difference exists between the two with respect to cold tolerance it must be operative in the seedling stage, as Haller suggests, or through some other influence than differential mortality from cold.

DOCUMENTED CHROMOSOME NUMBERS OF PLANTS

(See Madroño 9:257–258. 1948)

Species	Number	Counted by	Collection	Locality
RANUNCULACEAE				
elphinium carolinianum Walter	n = 8	B. L. Turner, TEX[1]	*Thompson & Turner 96* TEX	Hardin County, Texas
virescens var. *macroceratilis* (Rydb.) Ewan	n = 8	B. L. Turner, TEX	*Turner 4395* TEX	Bexar County, Texas
SAXIFRAGACEAE				
axifraga ferruginea Graham	n = 19	K. I. Beamish, UBC	*Beamish 7828* UBC	Mt. Seymour near Vancouver, B.C., Canada
			Beamish 9000 UBC	Caulfeilds, near Vancouver, B.C., Canada
integrifolia Hook.	n = 19	K. I. Beamish, UBC	*Beamish 7057* UBC	Thetis Lake, Vancouver Island, B.C., Canada
			Beamish, Vrugtman & Sparling 8017 UBC	Elk Falls, Vancouver Island, B.C., Canada
montanensis Small	n = 19	K. I. Beamish, UBC	*Vrugtman, Beamish & Kallio 9027* UBC	Princeton-Merritt Road, B.C., Canada
occidentalis Watson sensu lat.	n = 19	K. I. Beamish, UBC	*Beamish, Vrugtman & Sperrings 8224*, UBC	Botanie Valley, near Lytton, B.C., Canada

---

[1] Symbols for institutions are those listed by Lanjouw and Stafleu. Index Herbariorum, Part I. Second edition, 1954, Utrecht.

SPECIES	NUMBER	COUNTED BY	COLLECTION	LOCALITY
Saxifraga tolmiei T. & G.	n = 15	K. I. Beamish, UBC	*Beamish 7831* UBC	Mt. Seymour n Vancouver, B.C Canada
UMBELLIFERAE				
Pseudotaenidia montana Mackenz.	2n = 22	R. L. Guthrie WVA	*Guthrie* s.n. UC	Greenbrier Cou W. Va.
GARRYACEAE				
Garrya lindheimeri Torr.	n = 11	B. L. Turner, TEX	*Turner 3967* TEX	Austin, Travis County, Texas
VERBENACEAE				
Verbena hastata L.	n = 7	J. D. Poindexter, KANU	*Poindexter 33* KANU	Douglas Coun Kansas
bracteata Lag. & Rodr.	n = 7	R. C. Jackson, KANU	*Poindexter 18* KANU	Trego County, Kansas
stricta Vent.	n = 7	J. D. Poindexter, KANU	*Poindexter 37* KANU	Douglas Coun Kansas
urticifolia L.	n = 7	J. D. Poindexter, KANU	*Poindexter 9* KANU	Douglas Coun Kansas
SCROPHULARIACEAE				
Penstemon clutei A. Nels.	n = 8	R. C. Jackson, KANU	*R. C. & S. W. Jackson 2683–1* KANU	Coconino County, Arizona
COMPOSITAE				
Blennosperma nanum (Hook.) Blake var. *robustum* Howell	n = 7	R. Ornduff, UC	*Ornduff 4963* UC	Pt. Reyes, Marin County, California
Encelia frutescens Gray	n = 17	R. C. Jackson, KANU	*Jackson 2684* KANU	Coconino County, Arizona
Haplopappus havardii Waterfall	n = 4	R. C. Jackson, KANU	*Jackson 2717* KANU	Lea County, New Mexico
phyllocephallus DC. subsp. *phyllocephalus*	n = 6	R. C. Jackson, KANU	*Jackson 2610* KANU	Cameron County, Texas
phyllocephalus subsp. *annuus* (Rydb.) Hall	n = 6	R. C. Jackson, KANU	*Ungar 729* KANU	Stafford County, Kansas
spinulosus (Pursh) DC. subsp. *spinulosus*	n = 4+1	R. C. Jackson, KANU	*Jackson 2455–1* KANU	Socorro County, New Mexico
spinulosus (Pursh) DC. subsp. *spinulosus*	n = 4+2	R. C. Jackson, KANU	*Jackson 2455–14* KANU	Socorro County, New Mexico

Species	Number	Counted by	Collection	Locality
Machaeranthera blephariphylla (Gray) Shinners	2n = 8	R. C. Jackson, KANU	*Jackson 2901* KANU	Durango, Mexico
tagetina Greene	n = 4	R. C. Jackson, KANU	*Jackson 2600* KANU	Hidalgo County, New Mexico
Porophyllum scoparium Gray	n = 12	R. C. Jackson, KANU	*R. C. & S. W. Jackson 2701* KANU	Otero County, New Mexico
Psilostrophe cooperi (Gray) Greene	n = 16	R. C. Jackson, KANU	*R. C. & S. W. Jackson 2693* KANU	Yavapai County, Arizona
Sclerocarpus uniserialis (Hook.) Benth. & Hook. f.	n = 12	B. L. Turner, TEX	*Turner et al. 3313* TEX	Jackson County, Texas
Viguiera adenophylla Blake	n = 17	C. B. Heiser, IND	*Stoutamire 2813* IND	North of San Luis Potosí-Nuevo Leon state line, Mexico
deltoidea var. *Parishii* (Greene) Vasey & Rose	n = 18	C. B. Heiser, IND	*Neher* in 1958 IND	Near Palm Springs, Riverside County, California
dentata var. *brevipes* (DC.) Blake	n = 17	B. L. Turner, TEX	*Turner 4463B* TEX	Austin, Travis County, Texas
porteri (A. Gray) Blake	n = 17	C. B. Heiser, IND	From seed (*Duncan*) *Heiser 4561* IND	DeKalb County, Georgia
stenoloba Blake	n = 17	C. B. Heiser, IND	From seed *Tucker 3131*	Eddy County, New Mexico

REVIEW

Carex—Its Distribution and Importance in Utah. By Mont E. Lewis. Brigham Young University Science Bulletin, Biological Series 1(2):1–43. 1958. $1.00.

"The purpose of this report is to bring available information concerning the Carex species in Utah up to date." With these modest words Mr. Lewis of the United States Forest Service intermountain regional office in Ogden, Utah, introduces his excellent and original study of the identification, distribution, ecology, and grazing values of Utah carices.

Since the only Utah flora, namely Tidestrom's, is now over a third of a century old, a modern study such as this is most welcome. It is doubly welcome in that it comes from a representative of the federal organization which spends more man-hours interpreting the native plant cover of Utah than any other group. It is gratifying that a man primarily concerned with administration should take the time to produce a work such as this.

The report contains a diagrammatic summary of the mountain physiographic provinces of Utah and of their zonal belts of vegetation. Most interesting floristic, vegetational, and ecological problems are evident from the scattered occurrence of *Pinus ponderosa,* a local intrusion of *Pinus contorta* into the state, a varying amount of pinyon-juniper vegetation in different provinces, a constantly present but supposedly seral aspen-fir belt, and scattered alpine vegetation. Descriptions as well as explanations of most of these phenomena are still lacking in the botanical literature. For subsequent editions we hope Mr. Lewis will find time and opportunity to prepare altitude scales to this zonal vegetation diagram and to characterize the plant communities and floras concerned.

Although the physiographic units used certainly make far more sense for describing the distributions of plants within Utah than do county units, floristic units would be best of all. Do the physiographic divisions of Utah coincide with floristic divisons? For those unfamiliar with floras using floristically defined areas to describe plant distributions, reference may be made to the "Flora of the USSR" [cf. Stearn's paper in the New Phytologist 46:61–87, 1947. Note that a new map appears in Volume 18 (1952) of the Flora USSR] and to recent local floras such as those of Tadzhikstan, Kazakstan, Central Siberia, Leningrad and Murmansk regions, etc. Hylander's new Scandinavian flora and the new Greenland flora employ similar schemes.

Illustrations of named *Carex* species explain the terminology used in the keys. These keys do not exactly duplicate Mackenzie's and are easier to use for identification to section and to species. They require ripe perigynia; so do most *Carex* keys. For this reason A. Neumann's key to the carices of northwest Germany in vegetative condition deserves mention (Mitteil. Floristischsoziologischen Arbeitsgemeinschaft 3:44–77, 1952). Unfortunately, of the 126 taxa keyed by Neumann, only 6 are found among Lewis' 102 taxa. The species descriptions are pertinent and comparable; distinguishing features are frequently mentioned, and here the author uses his field experience to great advantage.

Distribution statements are short but probably adequate, with the Utah areas given in as full detail as present knowledge permits. This present knowledge is so poor as to make a phytogeographer weep, but one result of Lewis' work will be a rapid advance in our knowledge of where various carices do grow. The ecological data are excellent and far better than anything else available. Writers of extra-Utah floras can most profitably use these data for comparisons. Finally, all interested in range management will treasure Lewis' unique notes on forage values.

The monograph closes with an excellent list of local references, a glossary, an index, and a table summarizing for all species their distribution by physiographic provinces, the mountain belt of vegetation in which they occur, their habitat within this belt, their abundance, and geographical distribution.—Jack Major, Botany Department, University of California, Davis.

NOTES AND NEWS

Edward Lee Greene Correspondence—Persons interested in the botanical history of the western United States may find material of value in the correspondence of Edward Lee Greene now in the archives of the University of Notre Dame. This file includes letters to Greene over a period of forty or more years of his botanical career. These range from single letters commenting on specimens or requesting information to extensive correspondence from many of the notable figures in botany. This material is available to scholars able to visit the University of Notre Dame. Also microfilm copies of letters can be supplied at about four cents per picture and photostat copies at about forty cents per copy.

The following list includes the names of most correspondents whose letters are in the Greene files at Notre Dame. It is not necessarily complete. Some of the material is not alphabetically filed and no catalogue is available at present. To indicate the approximate extent of the correspondence from individuals the following scale is used:

A. one or two letters
B. approximately five
C. approximately ten
D. approximately twenty five
E. extensive, usually fifty or more

These designations are based on estimates and not on actual counts, and they do not purport to indicate the intrinsic interest or importance of the letters.

Abrams, L. R.	A
Alderson, R. D.	B
Allen, A. A.	A
Allison, E. M.	A
Ames, O.	A
Anderson, C. L.	B
Andres, H.	A
Andrews, L.	C
Arber, Agnes	A
Arthur, J. C.	A
Atkinson, G. F.	A
Austin, R. M.	C
Autran, E.	A
Bailey, L. H.	B
Bailey, W. W.	A
Baillon, L.	A
Baker, C. F.	E
Baker, M.	A
Balfour, I. B.	A
Ball, John	A
Bancroft, F. & R.	A
Barnes, W.	A
Barnhart, J. H.	C
Bartlett, H. H.	A
Batalin, A.	B
Bates, J. M.	A
Baxter, M. S.	A
Beal, W. J.	A
Bebb, M. S.	E
Becker, W.	A
Beguinot, A.	A
Bell, A. A.	A
Benton, L. E.	A
Bernard, H.	A
Bessey, E. A.	A
Bessey, C. E.	C
Best, G.	A
Bethel, E.	A
Bicknell, E. P.	D
Bioletti, F.	B
Bissell, C. H.	A
Blake, A.	A
Blankinship, J. W.	A
Blochman, J.	D
Blumer, J. C.	D
Boardman, S. L.	A
Bolander, H. N.	A
Bonté, J. H.	B
Brainerd, E.	D
Bramton, E.	A
Brand, Dr.	A
Brandegee, K. & T. S.	B
Brinton, J. B.	A
Briquet, J.	A
Britten, J.	A
Britton, N. L.	D
Brown, C. E.	A
Brown, J. S.	A
Bruckett, G.	A
Buchanan, W. D.	A
Buckenau, F.	A
Budworth, G.	A
Bull, H. R.	A
Burgess, E. S. & T. J.	A
Burglehaus, F. H.	A
Burkill, I. H.	A
Burrall, H. D.	A
Buscalioni, L.	A
Bush, B. F.	D
Butler, F. & G.	A
Buysman, M.	A
Campbell, D. H.	A
Canby, W. M.	A
Candolle de, Alp.	A
Case, J. H.	A
Chase, A.	A
Choate, H.	A
Clarke, F. L.	A
Claybrooke, G.	A
Cleveland, D.	C
Cockerell, T. D. A.	C
Cocks, R. S.	A
Cole, L. B.	A
Conard, H. S.	A
Cooper, A. J.	A
Copeland, E. B.	A
Coulter, J. M.	C
Coville, F. V.	D
Crawford, J.	A
Cross, E. R.	B
Curtis, G. P.	B
Cusick, Wm. C.	B
Davidson, A.	B
Davidson, G.	A
Davidson, J.	B
Davy, J. B.	B
Day, D. F.	B
Dayton, W. A.	A
Deam, C. C.	D
Deane, W.	A
Delafield, M.	A
Derby, G.	A
Dewey, L. H.	A
Dickson, J. M.	B
Dodge, C. K.	D
Donnelly, H. B.	A
Dudley, W. K.	A
Duggan, J.	A
Dupret, H.	A
Dyer, W.	A
Earle, F. S.	A
Eastwood, A.	D
Eaton, A. A.	A
Egerton, J. B.	A
Eggert, H.	A
Eggleston, W. W.	A
Elliot, W.	A
Ellis, J. B.	B
Elmer, A. D. E.	B
Engelmann, Geo.	E
Evermann, B. W.	A
Farr, E. M.	B
Farwell, O. A.	D
Fawcett, Wm.	A
Fedde, F.	B
Fernald, M. L.	B
Fischer, T.	A
Fitzpatrick, T. J.	A
Fletcher, J.	D
Friedlander, R.	B
Fronani, E.	A
Gager, C. S.	A
Ganong, W.	A
Garrett, A. O.	A
Gates, F. C.	A
Gautier, G.	A
Gerard, J. N.	B
Gibbons, G.	A
Gibson, A.	A
Gormann, M. W.	A
Grant, G. B.	C

Gray, A.	E
Greenman, J. M.	A
Gregorson, D.	A
Gregory, E.	A
Grimes, E. J.	A
Grose, I. F.	A
Grout, A. J.	A
Guillou, A.	A
Haberer, J. V.	A
Harger, E. B.	A
Harper, R. M.	A
Hasse, H. E.	A
Hastings, G.	A
Havard, V.	A
Hedrick, U. P.	A
Heimer, I. A.	A
Heller, A. A.	D
Henderson, L.	A
Henry, J. K.	C
Hensen, G.	A
Hill, E. J.	A
Hillegass, G. W.	A
Hine, J. S.	A
Hitchcock, A. S.	A
Holden, E. S.	A
Hollick, A.	A
Holm, T.	A
Holmes, J. A.	A
Holzinger, J. W.	A
House, H. D.	D
Howe, M. A.	D
Howell, T.	A
Huth, E.	A
Jaggar, A. L.	A
Jennings, O. E.	A
Jepson, W.	D
Johnson, R. H.	A
Jones, M. E.	A
Jordan, D. S.	A
Kearney, T. H.	A
Keller, R.	A
Kelsey, F. D.	A
Kennedy, P. B.	A
Kneipp, L. F.	A
Knight, O. W.	A
Knuth, R.	A
Koehne, E.	A
Krautter, L.	A
Kreke, M.	A
Kumlein, L.	A
Kunze, O.	A
Langlois, A. B.	A
Leiberg, J. B.	B
Lemmon, J. G.	A
Limberger, W. B.	A
Lloyd, F. E.	A
Lunell, J.	D
Lyon, W. D.	B
Lyon, W. S.	A
MacDougal, D.	A
Macfarlane, J. M.	A
Mackenzie, K. K.	A
MacMillan, C.	B
Macoun, John	E
Maxwell, C. F.	A
Metcalfe, O. B.	B
Millspaugh, C. F.	B
Mohr, C.	A
Morong, T.	A
Moseley, E. L.	A
Moyer, L. R.	A
Mueller, Barron F. von	A
Mulford, A. J.	A
Nelson, A.	D
Nelson, E.	A
Nieuwland, J.	D
Ogden, H. V.	A
Olney, S. C.	D
Orcutt, C. R.	B
Osterhoutt, G. E.	B
Parish, S. B.	C
Parry, C. C.	D
Patterson, H. N.	B
Paull, C. F.	B
Pearson, G. A.	A
Peekinpah, L. A. R.	A
Pennell, F. W.	A
Phelps, O. P.	D
Piper, C. V.	B
Pollard, C. L.	B
Pond, C. F.	A
Porter, C. E.	B
Porter, T. C.	D
Price, C. G.	B
Pringle, C. G.	B
Reed, F.	A
Robinson, B. L.	C
Rose, J. W.	C
Rosendahl, C. O.	C
Rusby, H. H.	E
Ruth, A.	B
Rydberg, P. A.	E
Sargeant, C. S.	B
Sears, J. H.	A
Shea, C. L.	A
Sheldon, E. P.	A
Sherff, E. E.	A
Siegfried, J. P.	A
Small, J. K.	C
Smith, C. P.	A
Smith, J. D.	A
Sonne, C. F.	B
Stapf, O.	A
Stone, Wilbur	A
Suksdorf, W. N.	C
Thornber, J. J.	A
Tracy, J. P.	B
Trelease, Wm.	B
Turner, J. H.	A
Underwood, L. M.	B
Urban, J.	B
Vasey, Geo.	B
Watson, Lawrence	E
Watson, Sereno	E
Wellington, R.	A
Weigand, K. M.	A
Wilder, C. M.	B
Wilson, N. G.	A
Wooton, E. O.	D
Wright, W. G.	A

The undersigned will be happy to supply further information or to try to locate correspondence from individuals not included in this list. Robert P. McIntosh, Curator, Greene-Nieuwland Herbarium, University of Notre Dame, Notre Dame, Indiana.

Urospermum picroides (L.) Schmidt in Berkeley. This cichoriaceous Mediterranean plant has apparently become established on a part of the University of California campus which has not been intensively landscaped (*Hall* in 1915, *Mason* in 1943, *Carter 4109* in 1960). *Urospermum picroides* may be readily recognized by its flat tuberculate achenes with long slender beaks, the ampule-like bases of which are enlarged to a diameter greater than that of the achenes.—Annetta Carter, Department of Botany, University of California, Berkeley.